HERMAN NELSON

HEATING AND VENTILATING EQUIPMENT

THE HERMAN NELSON CORPORATION

Service

The practice of heating and ventilating is an applied science. Each case is an individual engineering problem involving the selection and adaptation of some definite scheme of treatment. Herman Nelson products have always been designed, built and sold as essential elements in a system of heating or ventilating and not as mere equipment. In conformity with this idea, it has been the policy of THE HERMAN NELSON CORPORATION to impress upon purchasers of equipment the advantages of professional service and to co-operate with the architect and engineer in rendering this service.

In line with this policy, we have endeavored to provide the architect and engineer with sufficient information and data to properly adapt the system selected to the project at hand. In this catalogue we have tried to present each Herman Nelson product in such a manner as to enable him to readily grasp its intent, purpose and limitation, and to supply information and data that will enable him to adapt the product to his individual problem in such a manner as to insure best results.

Since heating and ventilating is a profession, it is obviously impossible to cover every phase of the subject. For this reason, we are represented throughout the country by practical trained Engineers who will gladly co-operate in the solution of heating and ventilating problems.

Guarantee

THE HERMAN NELSON CORPORATION products described in this catalogue, which have as their heating element the Herman Nelson Wedge Core Radiator, are guaranteed without reservation against defects in material or construction.

If it is demonstrated that these products will not perform in every way as claimed in this catalogue, the manufacturers will accept their return, pay all transportation charges, and refund every dollar received for them.

THE HERMAN NELSON CORPORATION

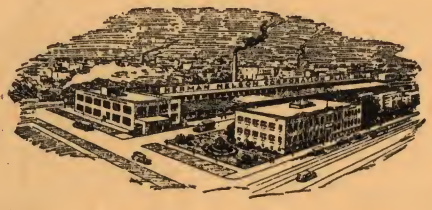
Moline  **Illinois**

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TABLE OF CONTENTS

The Herman Nelson
WEDGE CORE RADIATOR

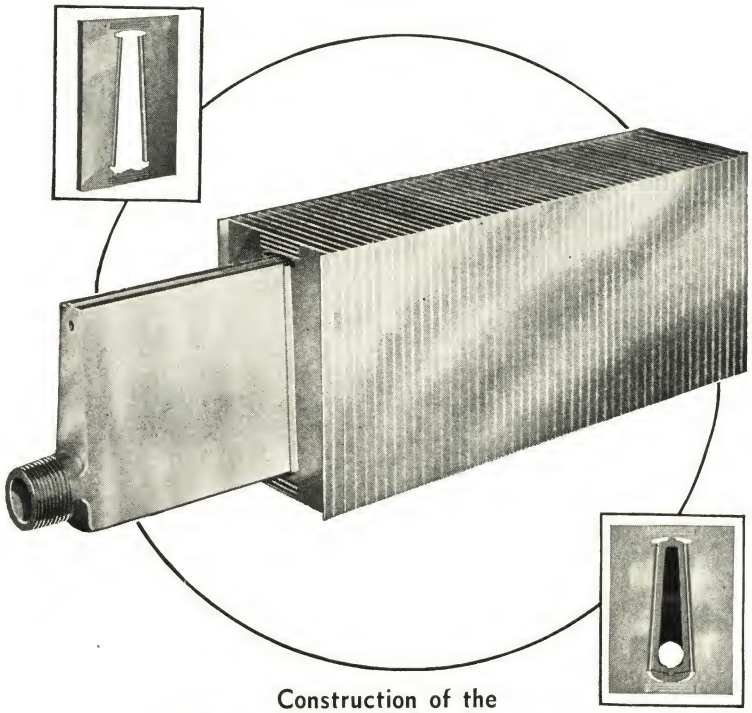
(Patented)

Its Development

The Wedge Core Radiator is the heart of the Herman Nelson heating and ventilating products described in the following pages, and an outstanding achievement in the art of heating and ventilating.

When THE HERMAN NELSON CORPORATION engineers set out to build smaller, lighter and better heating equipment, the radiator constituted the greater problem. Cast iron was almost universally used for this purpose but its bulk demanded too much space, its rough surfaces fouled easily and despite its apparent ruggedness, cast iron is brittle and easily damaged by frost—a serious weakness in many applications. Sheet steel radiators had proved to be unsuitable for the purpose.

The automotive industry suggested the use of non-ferrous metals but the design and construction employed was not practical *for use in the heating of buildings where the life of the heating equipment must be as long as that of the building.* Investigation led to the conclusion that soldered joints would not withstand the heat of steam and continuous expansion and contraction strains—to say nothing of freezing. The congested waterways and multiplicity of passages characteristic of automotive radiators were liable to stoppage and would not permit proper venting which eventually caused leaks.



Construction of the Herman Nelson Wedge Core Radiator

Careful study, with a background of many years' experience in the art of heating buildings, indicated that the proper solution lay in a non-ferrous radiator *especially designed for this service—not an adaptation from some other art.* This resulted in the HERMAN NELSON WEDGE CORE RADIATOR involving a unique design and method of construction. It has many distinctive features and renders practical the use of an ideal material.

Construction

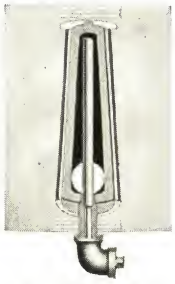
The HERMAN NELSON WEDGE CORE RADIATOR consists of a wedge shape fluid container or "core" on which a series of heat conductor plates are securely mounted. It is built entirely of aluminum which makes a light, practically non-corroding, compact and effective radiator. The core is a straight one-piece die casting of an aluminum alloy which is unusually strong, dense and ductile and has a high heat absorbing capacity. The conductor plates are of pure sheet aluminum which has a higher heat transmission value per unit of weight than even cast aluminum or any other metal.

Because of its light weight and high conductivity pure aluminum will transmit about twice as much heat per unit of weight than either copper or silver, six times as much as brass and twelve times as much as cast iron.

Unique in Design—Correct in Principle Effective in Practice

The exclusive design employed in the Herman Nelson Wedge Core Radiator renders aluminum practical for radiators. It is ideal for the purpose but is not suitable for the types of construction used in other nonferrous radiators because it cannot be commercially soldered, brazed or welded nor reliably cast except in simple forms and by special processes.

The "core" is provided with male threads at each end, for pipe connections. The outer surfaces are accurately machined. The plates are die stamped with interlocking flanged apertures which fit the core and afford a contacting area many times greater than the conducting area. Aluminum possesses the characteristic of seizing other metals in contact with it and when the plates are pressed onto the core under heavy pressure and locked and interlocked in position, a permanent efficient contact is obtained. The plates are also provided with interlocking outer flanges which act as separators, strengthen the plates and give the radiator a very neat appearance.



Air Vent for Hot Water Systems

Low Temperature Heating Surface

In the operation of the Wedge Core Radiator, heat is absorbed from the steam or hot water, transmitted through the plates and delivered to the air. This arrangement affords a very large amount of comparatively low temperature surface which is much better, for heating purposes, than the high temperature prime surface commonly used since it does not overheat or scorch the dust particles contained in the air.

Free Air Passage

It is unnecessary for the air passing through this heating element to continuously change its direction because the passages are straight and smooth. The air is quickly and uniformly heated by being split up into fine streams.

Clean and Sanitary

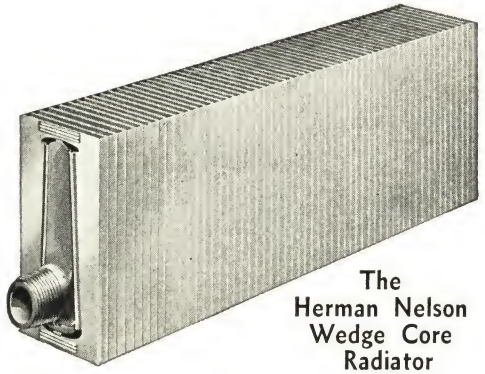
There is no place for dust or dirt to accumulate on the perfectly smooth, straight plates. From the standpoint of sanitation this is a very desirable feature.

Great Strength

The heating element is so substantially built that it has frequently withstood pressures as high as 500 pounds per square inch after the plates had been applied. All cores are regularly tested at 300 pounds hydrostatic pressure before assembly. The method of mounting the plates adds strength to the core and provides a very large factor of safety even when operated at a pressure of 150 pounds per square inch.

Proved Record of Durability

The Wedge Core Radiator was first regularly employed in the Univent, under conditions where outdoor air as low as 40° below zero is blown through the heating elements. Under these conditions it has served unfailingly for years withstanding expansion, contraction and water hammer strains. Often, through neglect, it has been frozen but never damaged.



The Herman Nelson Wedge Core Radiator

HISTORY OF VENTILATION

Ventilation an Early Puzzle

The harmful effects of bad air were recognized by men centuries ago and they resorted to a simple antidote—diluting it with fresh air. Thus originated the art of ventilation. As the art developed, however, problems arose which demanded an analysis of causes and effects. This proved difficult and has been a matter of more or less speculation ever since. The need for good ventilation is obvious and the fact that the admission of fresh air secures it has been adequately demonstrated. Nevertheless, the amount of fresh air required and other important details are moot questions which have puzzled students for many years.

To clear these questions it is first necessary to determine just why and when we need ventilation and just how fresh air affords relief. The only physiological need of air recognized by early students of the subject was for breathing purposes, and it was natural for them to suppose that the bad air conditions in congested quarters were due to respiration. It was also probably natural that they first sought a chemical explanation.

Oxygen Deficiency Seldom a Problem

Air essentially consists of a mixture of oxygen and nitrogen. Scientists knew this two hundred years ago. They also knew that oxygen is its life-sustaining constituent and it is reasonable that they should have first ascribed the trouble in crowded rooms to a deficiency of oxygen. Indeed there are people today who have this erroneous notion. Nevertheless, within the extant history of ventilation, shortage of oxygen has never been regarded by scientific men as a factor in the ordinary ventilating problem. Evidence is abundant that the amount of oxygen in the air may drop more than four points below normal without harmful physiological results, whereas it is rarely off more than one point in the most poorly ventilated spaces.

Carbon Dioxide Theory Disproved

The first theory of consequence was proposed toward the end of the eighteenth century by a French scientist named Lavoisier, who stated that the cause of distress in poorly ventilated rooms was due to excessive carbon dioxide. This gas is a product of combustion and is given off in respiration. It is quite uniformly distributed in the outdoor atmosphere, in small amounts, but is increased in occupied enclosures. For many years carbon dioxide was accepted as the scientific basis for ventilation. At first, it was commonly regarded as more or less poisonous, but after this had been definitely disproved, it was still deemed harmful in what was considered excess amounts.

About the middle of the nineteenth century, Max von Pettenkofer, a German scientist, demonstrated by careful and conclusive experiments that carbon dioxide, of itself, is no more responsible for the bad air conditions of poorly ventilated rooms than is a slight shortage of oxygen. We now know that the presence of this gas in amounts of 3%, which is twelve or fifteen times that in the most poorly ventilated school, is not harmful. Nevertheless, von Pettenkofer did not discredit carbon dioxide as a basis for ventilation practice. He contended that while chemical changes in the air were not accountable for its harmful effects in poorly ventilated rooms, excess carbon dioxide showed the extent to which the air has been used for breathing and was, therefore, an index of its purity. He retained the belief, without reason, that air was vitiated through respiration.

Organisms in Atmosphere Declared Harmless

This doctrine was a misfortune because it took for granted a danger that never existed and imbued the public with superstitious fear. With the growth of the miasmatic theory of disease, organic matter was suggested as the specific reason for ventilation. This premise was almost immediately challenged by scientists, at large, but it appealed to the popular fancy and has held its own, to some extent, to the present day. It is true that living organisms, in varying numbers, are present in the atmosphere—indoors and out, and, that products of organic decomposition are given off from the bodies and clothing of people, but investigation indicates that they are all harmless. Repeated tests have demonstrated that the organisms found in the atmosphere of crowded rooms are nonpathogenic and modern science assures us that there are no air-borne diseases.

Present Ventilating Laws and Ordinances Subject to Criticism

In spite of all failures to rationalize the carbon dioxide or respiratory basis for ventilation, it was relied upon for 150 years and has been recognized while formulating standards in ventilation practice up to this time. There are in effect in the United States many laws and ordinances, regulating the ventilation of schools and other public gathering spaces, which are based on this theory and which are now the subject of severe criticism by competent hygienists and others who have made a careful study of the subject.

The standards founded on the carbon dioxide theory were necessarily empirical. The amount of carbon dioxide regarded as a proper limit was eventually fixed, by more or less common agreement, at from six to ten parts in 10,000 of air. Ordinary outdoor air contains about four parts in 10,000 and the average man exhales $\frac{6}{10}$ of a cu. ft. of this gas per hour. This data permitted the derivation of a simple rule:

> *To find the cu. ft. of outdoor air required per minute, per occupant, to dilute to acceptable proportions the carbon dioxide of an occupied enclosure, divide 100 by the permitted excess of carbon dioxide, expressed in parts in 10,000.*

Present Ventilating Practices Considered Wasteful

According to this rule from 17 to 50 cu. ft. of fresh air would be required, per occupant, per minute, to maintain what was once regarded as a proper limit of carbon dioxide in occupied areas. In the case of school class rooms and similar closely occupied spaces, it was found impractical to circulate the larger amount, and a compromise of 30 cu. ft. per pupil, per minute, finally became a general standard. In the state of Ohio, the law has required six air changes per hour in school class rooms. This amounts to about 20 cu. ft. per pupil, per minute. These requirements are independent of weather conditions and demand the pre-heating of large amounts of cold air during the winter season. This involves a fuel and operating expense which is now considered unnecessary and constitutes a most important reason why practice should be changed.

Modern science asserts that respiration has little to do with the ventilation problem and that the ill effects of air in improperly ventilated rooms are due to its physical properties—temperature, humidity and activity. As put by the New York State Commission on Ventilation, the most obvious and important influences of the atmosphere upon human health and comfort are related to the heat regulatory system of the body rather than to chemical interchanges which go on in the lungs. "In other words, the problems underlying the physiology of ventilation are physical rather than chemical, cutaneous rather than respiratory."

This "Theory of Ventilation" was advanced by a German writer as early as 1883. It was proved sound by experiments at the Institute of Hygiene at Breslau in 1905, subsequently endorsed by eminent students on both sides of the Atlantic, and it is only a matter of time until it will be universally understood and accepted.

SCIENCE OF VENTILATION

The Human Heating System and Its Regulation of Body Heat

Man is energized through the chemical process of oxidation, which is a form of combustion. The blood absorbs oxygen from the air breathed into the lungs and carries it to the various body tissues where it combines with elements from the food we eat and liberates heat. The precise nature of these oxidations is not clearly understood at this time. They do not occur within the blood, yet the latter transports all the necessary elements. The process appears to be regulated by cellular control within the tissues themselves, and is independent of the amounts of oxygen and food elements present. In other words, the rate of oxidation is not governed by the supply of oxygen, as in the case of the combustion of fuel in a furnace, and is not, therefore, regulated by respiration.

The heat liberated by these oxidations in the tissues is, in turn, absorbed by the blood stream which serves to distribute it uniformly throughout the body. Man is a so-called, "warm-blooded" animal and to maintain life it is necessary to keep the body temperature fairly uniform, notwithstanding the various internal and external conditions which tend to change it. Obviously the heat generated must be dispersed and, in order to maintain a constant body temperature, the loss of heat must be nicely balanced and regulated according to physical requirements and environment. The human body is provided with a heat-

regulatory system which functions to separately control and balance heat production and dispersion, but the functions of this system are limited and we must resort to artificial assistance—shelter, clothing, heating and ventilating. Without these, man would be reduced to a narrower environment and lesser attainments.

In the case of heating and ventilating, we are primarily interested in the regulation of heat dispersion. So far as the body itself is concerned, regulation of heat dispersion is limited to a partial control of blood circulation and perspiration. Some of the heat generated is lost through respiration and excretions but most of it must be dispersed through the skin to the surrounding atmosphere. The blood is circulated through multitudinous blood vessels in the skin and transfers heat to the air in contact with the latter. If the body is active and produces a large amount of heat, or, if the atmosphere is warm and inactive, so that transference is difficult, we "feel warm." In response to this sensation, the blood vessels in the skin dilate, while those in the abdomen constrict, and a larger volume of warm blood is sent to the skin to be cooled. This is supplemented, if necessary, by perspiring which causes evaporation and further cooling.

Heat Stagnation the Cause ot Discomfort

The rate at which heat is transferred from the skin to the air depends upon the physical condition of the latter and it is the province of ventilation to maintain compatible atmospheric conditions for health and comfort. Dr. Leonard Hill, an eminent English hygienist says:

> *"In a crowded room, the air confined between the body and clothes of the people is warmed up to body temperature and saturated with moisture. This leads to sweating, wetness and flushing of the skin and a rise of skin temperature. The blood is sent to the skin and stagnates there instead of passing in ample volume through the brain and viscera, hence arise feelings of discomfort and fatigue. Heat stagnation is therefore the one and only cause of discomfort and all of the symptoms arising in the so-called vitiated atmosphere of crowded rooms are dependent upon heat stagnation. The moisture, stillness and warmth of the atmosphere are responsible for all the effects."*

It is not definitely known just how discomfitures of this kind affect health. Colds and other minor ailments are commonly credited to such conditions and it is not unlikely that they may have a cumulative effect that lowers physical resistance and leads to more serious maladies. They do, unquestionably, lower mental efficiency and capacity for work and this, in itself, is sufficient to demand the best of ventilation in school class rooms and other closely occupied spaces. Educators have recognized this fact for years and, as a result, all modern school buildings and many other spaces are equipped with ventilation systems.

How Body Heat Is Dispersed

It has been shown through physiological studies that the reactions which control the dispersion of heat from the human body are governed by the rate at which heat is removed from the skin. This heat is transferred to the surrounding atmosphere principally through the processes of convection and evaporation. There are radiant heat exchanges, but these are unimportant, if precautions are taken to properly limit them. A person sitting close to an exposed steam radiator may feel too warm, or, one near a cold wall may be chilled in a properly tempered room, but such discomfitures may be avoided if radiators are shielded and exposed walls insulated.

Body Heat Removal by Convection or Evaporation

Convection is the primary and normal method by which heat is dispersed from the body. The rate at which heat is transferred from the skin to the surrounding atmosphere through the process of convection depends upon the temperature and physical activity of the air. Heat, like water, seeks its level and flows from a higher to a lower temperature area. Flow occurs so long as there is a difference in temperature and, the greater the difference, the greater the rate of flow. Air, however, is a very poor conductor of heat. That in immediate contact with a warmer body absorbs heat but it does not pass the heat along. Therefore, it is soon raised to the temperature of the warmer body and transfer ceases unless it is displaced with cooler air. Consequently, the rate of transfer is augmented if the mass of air is in motion—physically active.

Evaporation is the supplementary process by which heat is dispersed from the body. The process of evaporation is that by which water is changed to vapor and taken up by the atmosphere. Air can only absorb a limited amount of moisture. The amount

which it contains, at a given temperature, as compared to the amount it could hold, if saturated, is called its relative humidity. If the temperature of the air is increased, it expands and its saturation limit is increased. Consequently, unless water is added, its relative humidity is lowered. In other words, relative humidity indicates the evaporating capacity of the atmosphere as well as the actual amount of vapor in it. This is why "moist" air becomes "dry" when heated. The amount of moisture is not changed but the capacity of the air to absorb moisture is changed.

The process of evaporation requires heat. In the cooling of the human body by the evaporation of perspiration this heat is requisitioned from the skin. This heat does not affect the temperature of the atmosphere but resides in the vapor in the form of latent energy—commonly referred to as the latent heat of vaporization. The rate at which evaporation of moisture takes place depends upon the relative humidity and physical activity of the atmosphere. The latter is a factor in diffusing vapor through the atmosphere just as it is a factor in diffusing heat in the process of convection.

Sensible Temperature

Therefore, the air conditions which affect the liberation of body heat and become the dominant factors in the applied science of ventilation are temperature, relative humidity and physical activity. The combined effect of these is frequently called, "sensible temperature," but the art of ventilation can scarcely be defined as the proper regulation of sensible temperature because it demands consideration of the component factors individually as well as collectively.

Air Motion

Physical activity in air is not essentially a matter of linear motion. Air has a form of physical activity, turbulence, which, *like boiling water,* lacks direction and cannot be defined in terms of velocity but which is very useful in the interspersion of heat or vapor. It is this form of physical activity which is of value in ventilation, whereas, directional currents are often objectionable. The latter expose various parts of the body to different effects and do not, of themselves, secure a thorough inter-mixture of the air. This character of physical activity in the atmosphere of ventilated spaces may be created through the medium of a high velocity air discharge jet directed toward the ceiling. This causes uniform agitation within the mass of air without forming pronounced directional currents.

The proper degree of activity is a matter of experimentation and has been found to be maintained when the air is circulated at a rate of six or more volumes per hour, depending upon the room characteristics.

Humidity

Of the three factors entering into the problem of ventilating rooms in which the occupants are engaged in sedentary vocations, relative humidity is probably least important. In normal health there is always more or less moisture given off by the skin. Except in the case of active exercise or too much clothing, this is maintained at a minimium, in a proper environment, and little heat is removed through the process of evaporation. Therefore, within certain limits, relative humidity is not important except as it affects the sensible temperature. If the atmosphere is too dry the occupants will feel cold, even though the air temperature is correct, and some physicians are disposed to feel that a dry atmosphere is deleterious to the membranes of the nose and throat. On the other hand, if the air is too moist, the room occupants will feel too warm, even though the air temperature be correct, and their clothing may become saturated with moisture and cause discomfort when they go out of doors. For these reasons, a close regulation of relative humidity is not considered necessary but provision should be made so that the relative humidity is maintained within proper limits.

Air Temperature

The proper temperature to be maintained in a room, in which the physical activity and relative humidity of the air are kept within proper limits, is about 70°. A variation of approximately 2° is permissible and a proper system of temperature regulation should control the system within this range. In order to maintain a temperature of 70° in a school class room it is necessary to provide artificial heat in severe weather and means for supplying varying amounts of fresh air for cooling, at other times.

The range of load in a single normal winter day, in the average school class room, is considerable. In the morning, prior to occupancy, it is necessary to utilize the full heating capacity of the system to make up the storage heat lost during the night and bring the room up to temperature. As soon as this is accomplished the load is reduced by about half. When the room is fully occupied the demand for artificial heat is still further reduced and, as the outdoor temperature rises to 30° or 35° the occupants themselves produce sufficient heat to maintain thermal balance. Above this point it becomes necessary to admit increasing amounts of outdoor air for the removal of body heat and odors.

Obviously it is not possible to keep the room temperature from rising above 70° when the outdoor temperature approaches this point unless refrigeration is employed. However, in localities where there are very few days, during the school season, when the outdoor temperature reaches this point the cost of refrigeration is not warranted and therefore, the above limitation is not serious.

The Herman Nelson
HER-NEL-CO SYSTEM OF VENTILATION

Old Idea Versus New

The Her-Nel-Co System reduces to practice the newer science of ventilation as applied to school class rooms and similar spaces. The essential difference between the older and newer ideas in ventilation is this: Under the older science, a fixed amount of outdoor air was supplied at all times, whereas, with the Her-Nel-Co System of Ventilation, outdoor air is admitted only when and as required.

Proper Ventilation Economically Maintained

Obviously, in the light of our present knowledge, current practice involves excessive capacity in steam supply and distribution equipment and an unnecessary waste of fuel. In fact, the greater portion of the steam required to operate the types of heating and ventilating systems heretofore employed is used to preheat large volumes of outdoor air under the erroneous impression that this air is needed to maintain a certain degree of chemical purity in the indoor atmosphere. With the Her-Nel-Co System, proper indoor atmospheric conditions are maintained at all times through physical agitation, humidity limitation and temperature control. Such outdoor air as is required for the removal of excess body heat is brought in fresh and is tempered to just the right degree through intermixture with recirculated air, but is not preheated.

Recently there has been more or less discussion concerning the ionization of air used for ventilation. While the causes and effects of ionization are matters of speculation at this time, it is generally believed that air is de-ionized by being passed over radiating surfaces. Since the outdoor air used in the Her-Nel-Co System of Ventilation is not passed over the radiator, de-ionization is avoided.

When 30 cu. ft. of fresh air per minute, per pupil is supplied school class rooms, under the present methods of ventilating, about 84% of the total load in subzero weather, 93% of it in freezing weather, and all of it in mild weather, is used for preheating air. By theoretical estimates and practical comparisons it can be shown that two-thirds of all the fuel consumed by a plant of this kind during a season, serves no other purpose. Where air is supplied on a basis of six room volumes an hour, as in the state of Ohio, about half the fuel is used for preheating outdoor air. Under the newer hygienic principles of ventilation, the fuel used in this manner represents a direct waste, all of which is avoided with the Her-Nel-Co System.

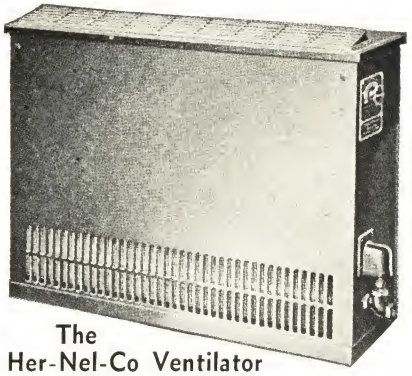
Not only does the preheating of large volumes of outdoor air demand a great waste of fuel, but it also requires excessive capacities in plant equipment. The peak operating load with the Her-Nel-Co System is only about one-sixth that in a system supplying 30 cu. ft. of out of door air per minute, per occupant, or, one-fourth that of a system providing six air changes an hour.

However, with the smaller plant, a larger "pick-up" load factor must be employed for reheating the building after a period of vacancy and, therefore, the rated capacity of the steam generating plant and distributing system should be from one-third to one-half as great. Moreover, the net saving in the initial cost of the boilers, accessory equipment and piping will not be in direct proportion to the capacity. Taking all things into consideration, however, the first cost of the Her-Nel-Co System is from 25 to 50% less than that of a first-class system of the older type.

Equipment Used with the Her-Nel-Co System

The principal equipment used in this system of ventilation is the Her-Nel-Co Ventilator illustrated below. One or more of these machines, together with the required amount of auxiliary direct radiation, is placed in each room to be heated and ventilated. For the average typical school class room, one ventilator is used and the capacity can be adjusted to properly ventilate any such room seating fifty, or less, pupils. For larger rooms, two or more Her-Nel-Co Ventilators, or Her-Nel-Co Magnavents, as illustrated on page 28, should be used.

No vents or so-called "foul-air" flues or outlets are ordinarily employed. The Her-Nel-Co Ventilators and direct radiators are the only apparatus required (aside from the steam generating and distributing system), except where automatic temperature regulation is employed.



The Her-Nel-Co Ventilator

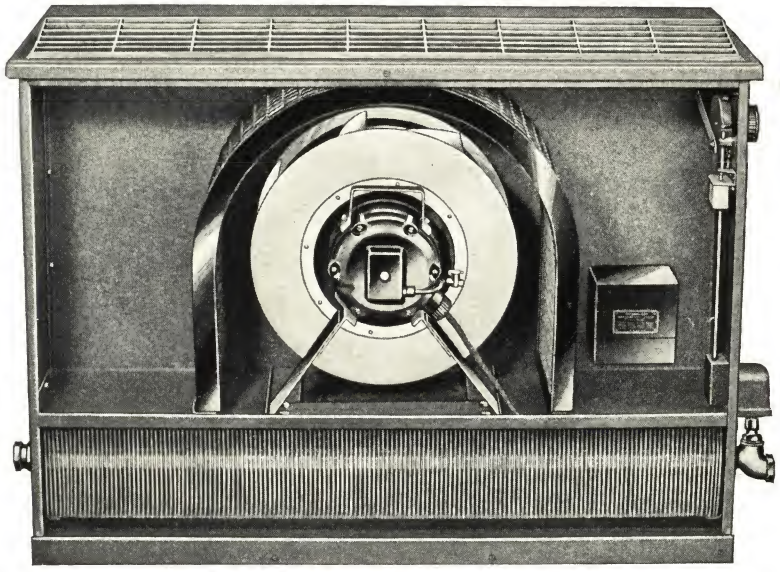
The necessary engineering data for properly designing a complete system of this kind is given in the following pages, and THE HERMAN NELSON CORPORATION maintains a corps of trained engineers who will gladly cooperate with architects and consulting engineers in laying out work of this kind.

THE HER-NEL-CO VENTILATOR

Construction

The Her-Nel-Co Ventilator consists of a high grade furniture steel cabinet designed to be placed against a wall, on the floor, at a central distributing point in the room to be ventilated. The preferred location is at the middle of the longer outside wall. Where structural conditions permit, the Ventilator may be partially recessed. The cabinet is provided with a neatly stamped grille in the lower part of the removable front for the admission of room air. A flanged opening in the back of the cabinet high enough to clear any spandrel beams, provides for the admission of outdoor air. An opening through the wall serves the latter. If it is an outside wall, a weather-proof louver and screen are provided as a part of the equipment and set in the face of the opening.

If the Ventilator is placed on an inner wall or partition, a flue or duct communicating with a source of fresh air supply must be provided. The discharge opening which consists of a cast aluminum, nozzle-formed patented grille is located in the top of the cabinet, near the front, and arranged to direct the air stream at a slight angle toward the ceiling and away from the wall.



The Her-Nel-Co Ventilator with Front Removed

Cabinet

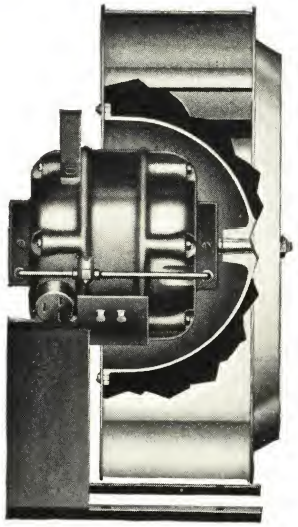
The Her-Nel-Co Ventilator cabinet is about 45 in. long, 33 in. high and 16 in. deep, and is beautifully finished in genuine "Morocco" enamel with plated hardware. It is arranged to be fastened against the wall with a gasket which prevents any air leakage. The entire front is removable, giving free access to all parts. The cabinet contains a radiator for heating the indoor air (only), a fan motor unit for forcing circulation, a filter for removing dust and dirt, a steam jet humidifier and the dampers and mechanism which regulate the admission and intermixture of indoor and out of door air in accordance with U. S. Letters Patent Nos. 1,753,156 and 1,753,157 issued April 1, 1930.

Radiator

The radiator is the well known Herman Nelson Wedge Core Radiator (described in detail on pages 2 and 3), especially designed for this service and used exclusively in Herman Nelson Ventilating Equipment since 1925. It is constructed entirely of aluminum and is light, compact, sanitary, efficient, sturdy and non-leakable. It is located in the forward lower compartment of the Ventilator, which compartment serves as a conduit for recirculated air. In this location the radiator not only heats such indoor air as enters the Ventilator when the damper to this compartment is open, but also any cold air which might leak into the cabinet and settle to the bottom of the same, thereby preventing cold drafts on the floor.

Fan and Motor Unit

The fan and motor unit is also of the exclusive Herman Nelson patented construction which has proved so successful and popular. It is quiet, efficient, sturdy, powerful, sanitary, simple and reliable. It is located in the forward upper compartment of the Her-Nel-Co Ventilator along with the filter and draws air from either indoors or outdoors or both, according to the position of the dampers, and delivers it through the filter and discharge nozzle into the room. It is portable and easily inspected, cleaned, oiled or taken out when the cabinet front is removed. The cone type fan is constructed entirely of aluminum. The motor, which can be furnished to operate with practically any type of electric service, is of the well known Her-Nel-Co design which has heretofore proved so reliable in this service. These motors are highly efficient, noiseless, self-lubricating and electrically self-starting.



Fan and Motor Unit

Air Filter

The Air Filter

The air filter is of a special horseshoe design, arranged to give extra large filtration area. It completely encloses the fan and motor unit so that no air can be delivered into the room without passing through the filter. This filter is so arranged that it can be easily inspected or removed for cleaning when the front of the cabinet is removed. Emphasis is laid on the fact that the filter is located on the discharge side of the fan where it is not subject to low temperatures or weather effects and therefore the oil remains viscous and highly effective. At the same time, since it is not exposed to radiant heat effects, the oil is not evaporated and wasted.

Dampers

The dampers used in the Her-Nel-Co Ventilator are of the balanced type, carefully designed and mounted on weather-proof bearings. A single blade damper, located near the bottom of the rear compartment of the Ventilator on the discharge side of the radiator, is used for controlling the admission of recirculated indoor air. The damper which controls the admission of outdoor air is of the multiblade louver type and is located directly in the outdoor inlet opening. These dampers are mechanically inter-connected so that the outdoor air supply is reduced as the indoor air supply is increased and vice versa.

Steam Jet Humidifier

When required, a steam jet humidifier is furnished and located in the lower radiator compartment and connected to the radiator in such a manner that it operates whenever the radiator operates, thereby providing humidity whenever the air is heated and expanded but not at other times. This forms a method of automatically limiting the humidity. The jets are self-cleansing and noiseless.

Control

The Her-Nel-Co System may be either manually or automatically controlled but in either case, the various elements of control are mechanically co-ordinated in accordance with the patents previously mentioned.

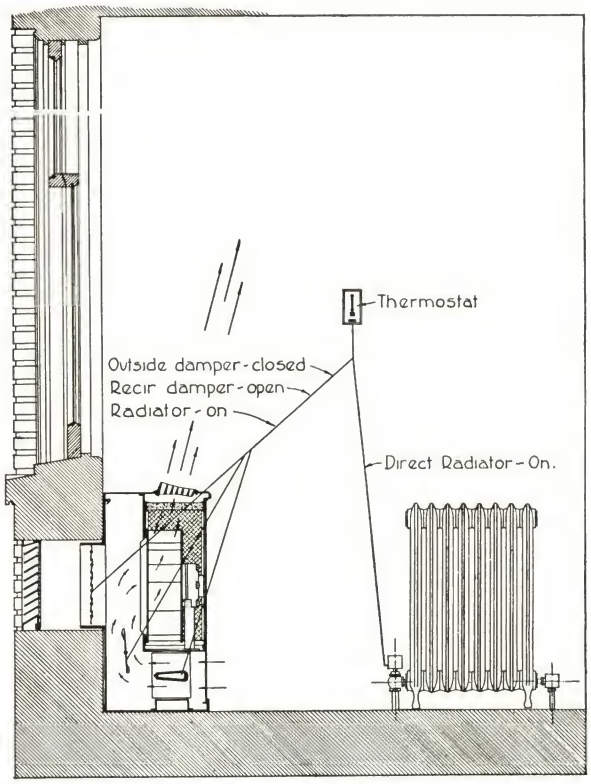
Application of the System to Various Conditions

The illustrations on this and the following page show the successive steps in the Her-Nel-Co System of Ventilation from maximum heating to maximum cooling duty.

These steps are not necessarily continuous nor is the cycle necessarily completed in a single school day in a given instance. Obviously the range and the exact character of the duty depends upon weather conditions, room exposures and occupancy.

In the case of a northerly exposed room, in very cold weather, the system may never get beyond condition "B" or "C," whereas, in a well protected southerly room, in mild weather, the complete cycle may be performed in a few hours.

In the average school class room, on a normal winter day, the cycle, with the possible exception of the last stage, should be completed during the day.



Condition "A"

Room chilled after night period. Her-Nel-Co Ventilator automatically adjusted for full heat delivery. Recirculating room air

Condition "A"

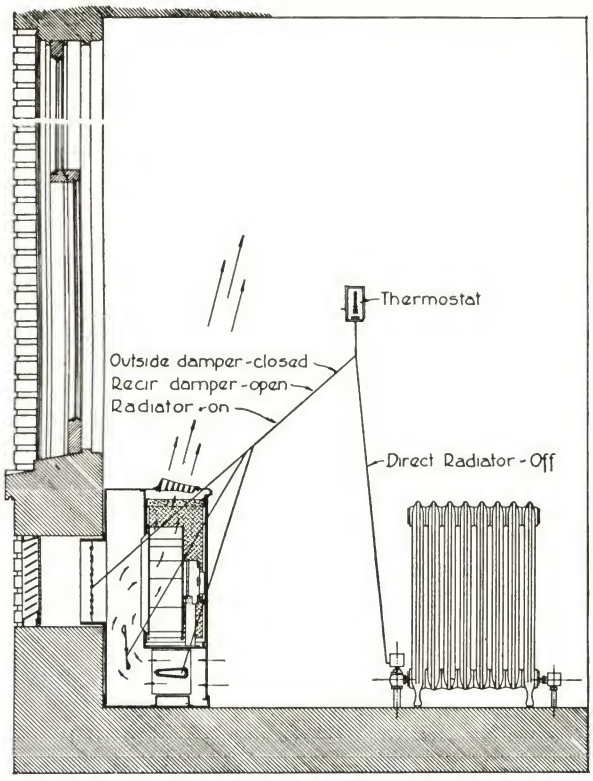
Condition "A" is that in which the system is developing its maximum heat capacity for the purpose of preheating the room in the morning, prior to occupancy. The system will always be in this condition when the room temperature is below normal, and the period of time during which it will remain in this condition will depend upon the weather.

It rarely requires less than one-half hour nor more than one hour to preheat a room after the night period.

Condition "B"

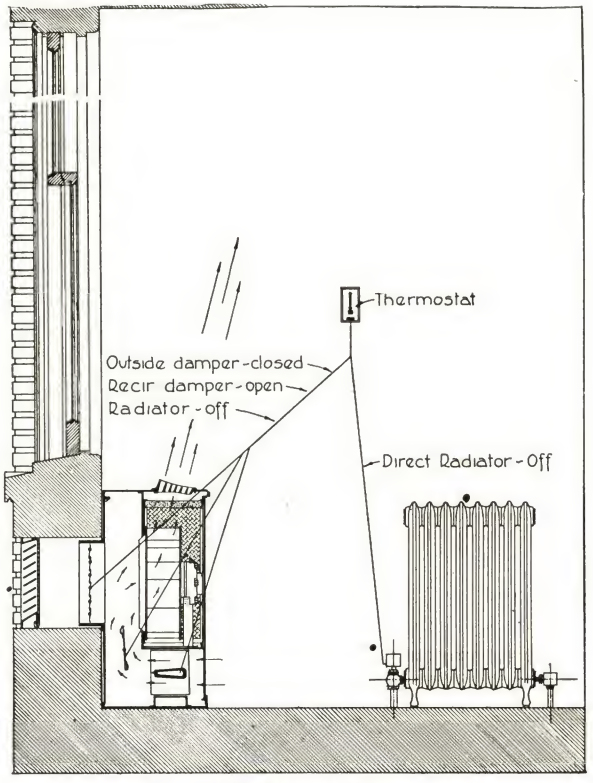
Condition "B" illustrates the first step in restricting heat output—that of cutting off the direct radiator.

This will ordinarily occur shortly after the room has been occupied.



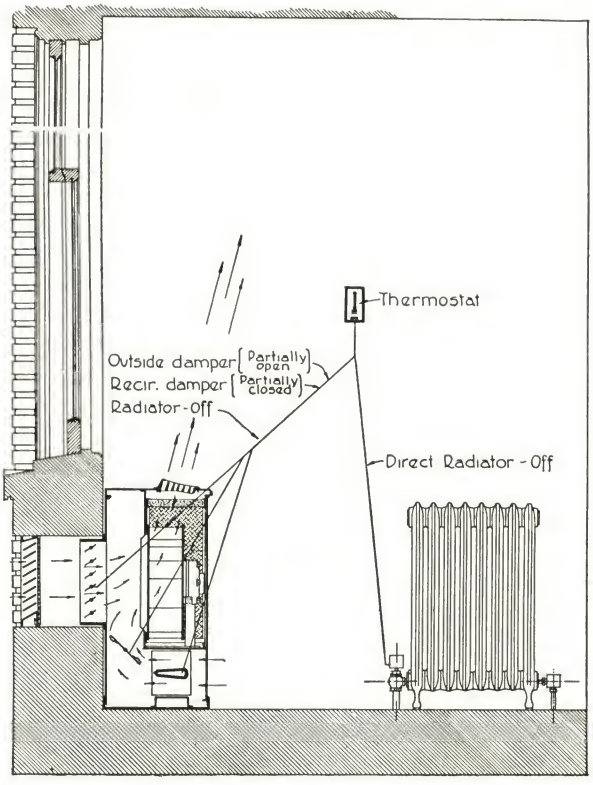
Condition "B"

Room ready for occupancy. Direct radiator shuts off which is the first step in restricting the heat supply to room



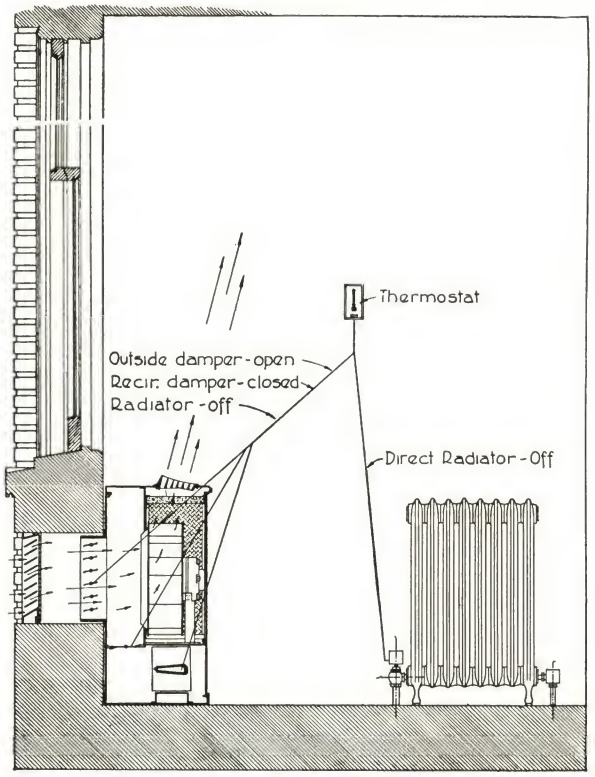
Condition "C"

Due to occupancy, gradual rise in outside temperature, and sun effect, no artificial heat is now required. Her-Nel-Co Ventilator recirculates air without heating for the purpose of air motion and uniform distribution



Condition "D"

Due to continued occupancy, rising outside temperature, and increased sun effect, room now requires outdoor air



Condition "E"

Due to continued occupancy, rising outside temperature, and increased sun effect, room now requires *full volume* of outdoor air

Condition "C"

Condition "C," in which the steam supply is cut off from the heating element in the Her-Nel-Co Ventilator represents a neutral state in the system and a condition of thermal balance in the room. It usually occurs when the outdoor temperature is between 30 and 35° F. depending, however, upon exposure and occupancy. In this stage, the supply of heat is entirely cut off and no outdoor air is admitted for cooling but the system is recirculating and maintaining a proper condition of physical activity in the room atmosphere.

The change from condition "B" to condition "C" is a graduated one during which the steam supply to the heating element in the ventilator is regulated according to requirements. The system may remain in a condition where more or less steam is supplied to the heating element in the ventilator for hours.

Condition "D"

Condition "D" is the first step in cooling. Operating coincidentally, the recirculating damper is gradually closed and the fresh air damper gradually opened. The illustration shows the dampers in an intermediate position. In the average case, the machine will remain in this condition during the afternoon session and the system will deliver more and more outdoor air as required for removing the excess body heat and odors.

Condition "E"

Condition "E" represents the maximum cooling condition of the system in which the recirculating damper is entirely closed and nothing but outside air is delivered by the equipment. In this condition the system will serve to maintain the temperature in the average class room within 10 to 15° of that out-of-doors in addition to activating the air.

Thermal Balance Without Waste of Fuel

It will be noted that the Her-Nel-Co Ventilator operates in such a manner that no outdoor air is ever heated either directly or indirectly through the system, and, therefore, there is never any waste of fuel. At the same time, this system will deliver more or less outdoor air throughout the day, except in extremely severe weather, and will always maintain a proper degree of physical activity in the room atmosphere. The system maintains a thermal balance at all times with direct reference to the room temperature.

Manual or Automatic Control

Manual Control—Where manual control is desired, the entire cycle of operation is covered through the single movement of a dial located on the right hand end of the cabinet, together with an etched instruction plate as illustrated below. Assuming that the machine is completely cut off, the first movement of the dial starts the electric motor and puts the machine in condition "A." Further movement gradually closes the steam valve and restricts the steam supply to the radiator until condition "C" is reached. Further movement gradually closes the indoor air supply and opens the outdoor air supply until condition "E" is reached. A reversal of the dial reverses the cycle of operations. Where manual control is used, it is necessary to control the direct radiators in the room independently but this does not cause a complication for the reason that the operator need only understand that the direct radiators need be on only when reheating in the morning or in extremely cold weather.

Automatic Control—With automatic temperature control all of the elements are operated automatically excepting that the fan and motor unit must be turned on and off through an independent switch.

Hand Control Dial

System Conforms to New Science of Ventilation

A careful study of the five illustrations on pages 10 and 11 will show how the Her-Nel-Co System of Ventilation conforms to the newer science of ventilation.

So long as the fan and motor unit is operating, the air in the room is recirculated or displaced at a rate which insures uniform, positive and continuous physical activity of the air. When it is cold outside and the demand for heat is greater than that created by occupancy, heat is furnished to the room, according to the demands, through the proper regulation of the direct radiators and the radiator in the Her-Nel-Co Ventilator.

When a state of heat balance is reached, the artificial heat supply is cut off and, when the supply of heat from within the room is greater than required, more or less outdoor air is admitted and thoroughly inter-mixed with the room air for cooling purposes. As hereinbefore mentioned, humidity is supplied whenever the air is reheated.

Therefore, the system automatically and continuously maintains a proper degree of air agitation, proper limitations in relative humidity, and accurate temperature regulation at all times in a very simple and effective manner.

Vent Outlets Not Required

As also previously mentioned, it is not ordinarily necessary nor desirable to provide vent outlets from the room. Such outlets interfere with recirculation and are never needed because even when the Her-Nel-Co Ventilator is supplying all outside air it finds an easy egress through crevices around the windows and doors and insures more uniform and better distribution than where separate vent flues are provided. If, in an unusual instance, it should be found that the full volume of outdoor air cannot be supplied without a vent, it is an easy matter to slightly shorten a door leading into a corridor and thus provide means for the exit of this air.

When and Why Direct Radiation Is Necessary

The question has been asked why direct radiators are necessary and why sufficient radiation is not provided in the Ventilator itself so that direct radiators may be eliminated. After a great deal of experimentation, it has been found that most of the difficulties in uniformly heating rooms of this character are due to air stratification created by the use of too high outlet air temperatures. In the interest of proper air diffusion and temperature distribution the outlet temperatures have been limited to 105° F. which obviously fixes the amount of radiation which can be placed in the Ventilator itself. With this limitation, the maximum heating capacity of the Her-Nel-Co Ventilator is equivalent to 120 sq. ft. of direct radiation and where more heating capacity is required it is necessary to use direct radiation. In some cases, particularly in small rooms with little exposure or in mild climates, the direct radiators may be eliminated without in any way affecting the system.

Herman Nelson Invisible Radiators (paneled type) (see pages 79 to 86) are recommended for this class of work because of sanitation, quick responsiveness to regulation, and the absence of radiant heat effects. Cast iron radiators retain a large amount of heat and consequently continue to give off heat for a considerable time after the valve has been closed. This is the cause of a great many complaints of overheating in school class rooms and cannot be corrected with cast radiation. Morever, pupils sitting near cast iron radiators are made uncomfortable through radiant heat effects unless the radiators are shielded, in which event they are generally unsightly and insanitary. Small children are frequently burned by cast iron radiators, whereas this cannot occur where Herman Nelson Invisible Radiators are used. The cost of the installation will be slightly greater with Invisible Radiators but they are well worth the difference and greatly enhance the appearance of the rooms in which they are placed.

When to Ventilate

Ventilation is primarily a matter of comfort, but since few of us are up to par when uncomfortable, it becomes a factor in personal efficiency and—eventually a matter of *health*. Therefore, as an art, ventilation consists of the circulation of air for the removal of excess body heat and odors.

In so far as comfort is concerned, ventilation is required in a room whenever the heat, due to occupancy, exceeds that which is transmitted through the outer walls. Therefore, outdoor conditions are a factor.

When the outdoor temperature is within a few degrees as high as that desired indoors, or higher, perfect comfort cannot be assured in a closely occupied room without resorting to refrigeration, but a reasonable degree of comfort may usually be had by opening windows. However, in crowded spaces, such as school class rooms, the atmosphere becomes uncomfortable under conditions when it is neither safe nor desirable to open windows.

This is the true field of ventilation and it is an important one under the climatic conditions which exist over the greater part of the temperate zone. In all heating and ventilating problems, we are prone to think in terms of hot or cold weather, but, as a matter of fact, what we have to live with most of the time, in the temperate zone, is moderately cool weather.

When to Ventilate (Continued)

In the more densely populated areas of the United States, there are only about four months of the year when it is safe to open windows for ventilation and in only one of these months are schools in session. During the remaining eight months, there are but a few days in most localities when the temperature is less than 20° or more than 60° F. This means that any room, such as a school class room which is well filled with people will be more or less uncomfortable during the greater portion of the year unless it is properly ventilated.

The extent to which a room is crowded, in this respect, is determined by the relation existing between the number of occupants and the amount of cooling surface in the walls. Since the latter also determines the amount of radiation required to heat the room, a simple empirical rule, with figures at hand, for determining when a room requires ventilation, is established by the ratio of the number of occupants (N) and the number of sq. ft. of direct steam radiation (R) required to heat the room from zero to 70° F. Experience indicates that it is not practical to rely upon open windows when the outdoor temperature is much less than 60° F. In other words, it is not safe to depend upon an outer wall cooling effect of more than 10° F. On this basis, a room should be artificially ventilated to insure comfort whenever R divided by N is less than 12.

The importance of comfort will depend upon circumstances. Obviously, no hard and fast rule can be applied in fixing its importance. The purpose for which the room is to be used, together with the duration and frequency of the possible periods of discomfort should be taken into consideration. If a room is to be used merely for rest or recreation, comfort is usually not as important as where the room is employed for work or study. In the first instances, comfort may be regarded as more or less of a luxury, whereas, in the second instance, it is a factor in personal efficiency and health. With reference to the duration and frequency of the periods of possible discomfort, a person can resist the effects for a short time more readily than for a long time and infrequent exposure is less dangerous than repeated exposures.

Cost of installation and maintenance are always to be considered and are frequently deciding factors. Since the Her-Nel-Co System requires no extra plant capacity or fuel to operate, and involves very little incidental installation expense, it may often be employed where ventilation by another method would be impractical or prohibitive in cost. This is particularly true in the case of existing buildings. Moreover, temporary installations are feasible because the character of the equipment is such that the apparatus may readily be changed or moved.

There are cases where ventilation may prove a good investment from a mere comfort standpoint, as in theatres and rest rooms. In the majority of cases, however, ventilation must be regarded from the more serious angle. No better example is afforded of the serious importance of ventilation than in schools which are crowded with pupils engaged in work and study for long periods of time every day.

Aside from the removal of normal body heat and odors, ventilation is frequently necessary for the removal of obnoxious odors, fumes or dust. Where this is the case, exhaust ventilation is usually employed and the subject needs little discussion. Aside from a variety of special industrial problems, the most common example of ventilation of this character is in toilets, kitchens, etc.

Models and Capacities of the Her-Nel-Co Ventilator

The Her-Nel-Co Ventilator is a compact ventilating unit designed to apply the Her-Nel-Co System of Ventilation to school class rooms and similar spaces. It is fully illustrated and described in the first section of the catalogue. The Her-Nel-Co Ventilator is made in but one size designated as the 4500 Series. It can be had in two models, however.

Model "J"

The Model "J", as illustrated on pages 16 and 17, is arranged to take outdoor air through an opening in the wall behind the machine and is the type generally preferred. When the intake opening is through an outer wall, as is usually the case, it should be protected with an air intake as shown on the following page.

Model "K"

The Model "K" is designed with the idea of taking outdoor air through the lower portion of a window opening and is provided with a long narrow intake located at the top of the cabinet and arranged to be built into the window construction as shown on pages 18 and 19. The intake sleeve is so constructed that it may be cut to fit on the job and a heavy wire screen in a steel frame is provided for use in the intake opening.

Construction Details

The Her-Nel-Co Ventilator may be arranged for either manual or automatic temperature control and is adaptable to either vapor, vacuum, gravity steam, or hot water systems. Filters and humidifiers are always recommended but may be omitted at the option of the purchaser.

All motors are of the adjustable speed type to obtain varying air deliveries and may be furnished for all of the more usual current characteristics.

As shown in the accompanying capacity table, both models are rated at three air deliveries and can be equipped with two different radiators, giving two heating capacities for each air delivery. All air deliveries are determined by the A. S. H. & V. E. standard anemometer method with the anemometer held 2 in. above the face of the grille. The air delivery in c.f.m. is determined by multiplying this velocity in feet per minute by the gross area of the discharge grille in sq. ft. (1.58 sq. ft.).

All heating capacities are given in equivalent sq. ft. of standard direct radiation (240 B.t.u.) based on 218° F. steam temperature and 70° F. room temperature. For all practical purposes the heating capacity of the Her-Nel-Co Ventilator, when the motor is not running and the outdoor dampers are closed, is equal to about 20 sq. ft. of direct radiation.

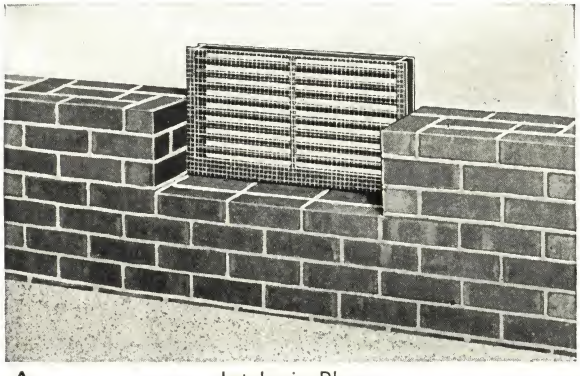
The standard air intake for the Model "J" is made of heavy copper bearing steel with riveted and welded construction throughout. After fabrication each intake is cadmium plated and painted with weather-resisting paint, with the result that the intakes will usually outlast the wall in which they are installed. Intakes are made in both the horizontal and vertical types as shown on page 16.

CAPACITIES OF HER-NEL-CO VENTILATORS MODELS "J" AND "K"

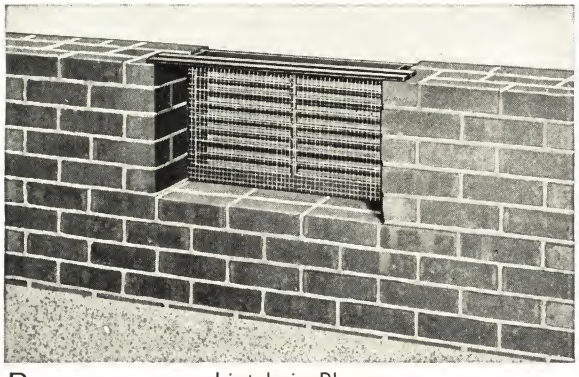
Serial number	Code word	Cu. ft. of air per min.	Heating capacity, sq. ft.
4514	Tabor	700	70
4515	Tacit	700	105
4524	Tales	800	75
4525	Talon	800	115
4534	Tansy	900	80
4535	Tardy	900	120

Heating capacities are given in sq. ft. of equivalent direct radiation and are based on a room temperature of 70° F. and steam temperature of 218° F.

Additional code words—Model J—Jalap. Model K—Kedge.



A. Intake in Place
(From inside of building)



B. Lintels in Place
(From inside of building)

C. Intake Opening Lined with Cement Mortar
(From inside of building)

D. Exterior View of Intake
Note intake is set back from face of wall

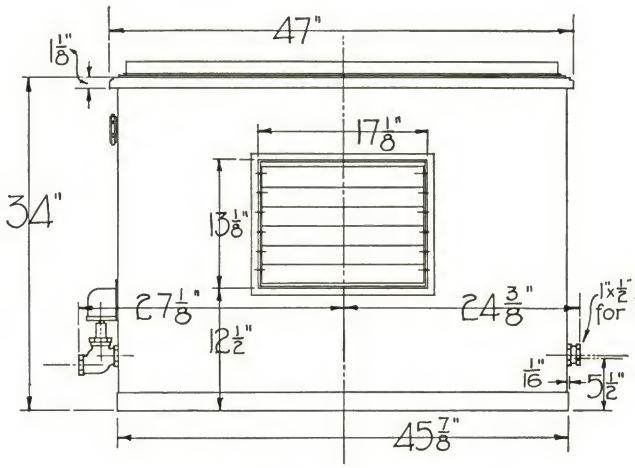
Installation of Intake

MODEL J DIMENSIONS

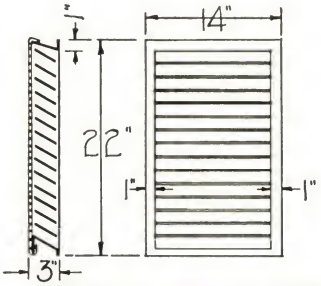
HER-NEL-CO VENTILATOR

WITH HAND CONTROL

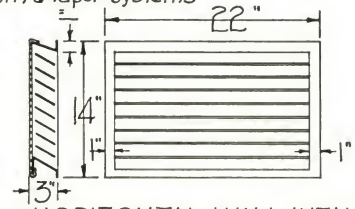
FOR AUTOMATIC CONTROL SEE MODEL K DIMENSION SHEET ••



REAR ELEVATION
Vacuum or Vapor System.

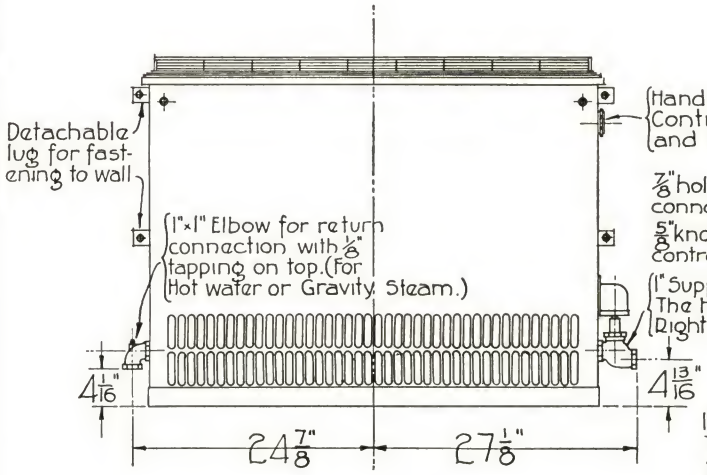


VERTICAL WALL INTAKE

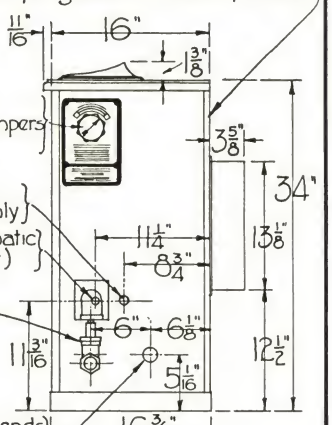


HORIZONTAL WALL INTAKE

Allow 3/8" on all roughing dimensions for gasket on back of cabinet.

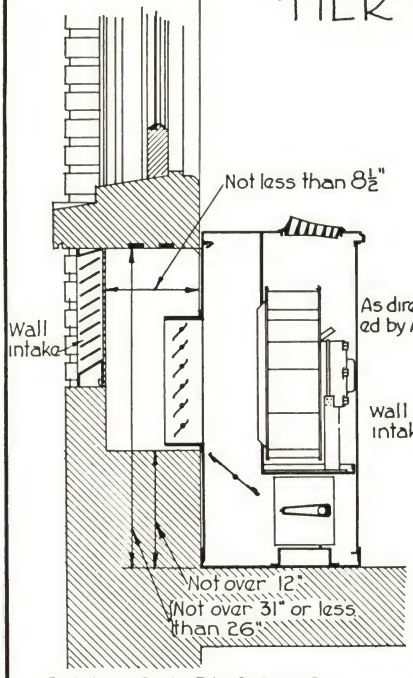


FRONT ELEVATION
Gravity Steam or Hot Water.

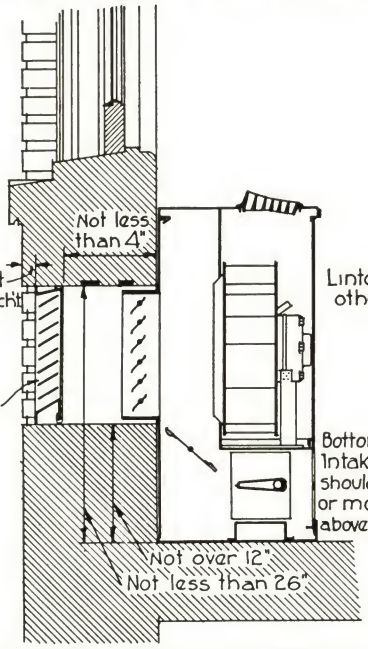


END ELEVATION

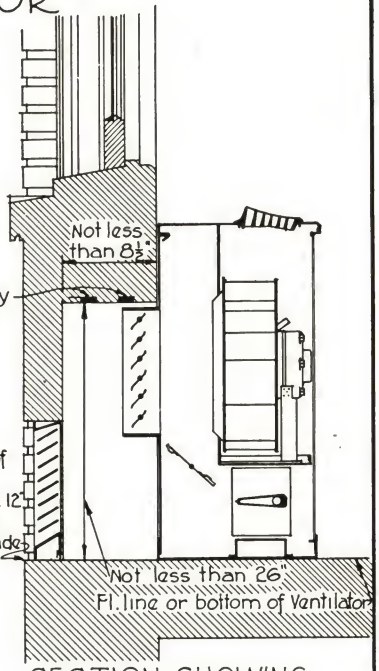
MODEL J APPLICATIONS
HER-NEL-CO VENTILATOR



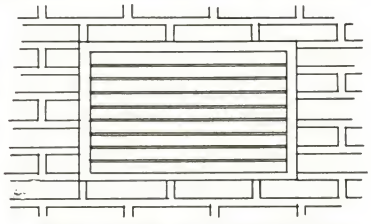
SECTION SHOWING HIGH LOCATION OF INTAKE



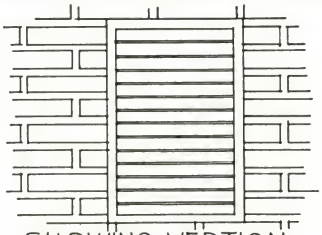
SECTION SHOWING STANDARD LOCATION OF INTAKE



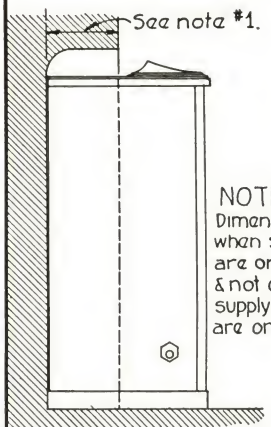
SECTION SHOWING LOW LOCATION OF INTAKE



SHOWING HORIZONTAL WALL INTAKE

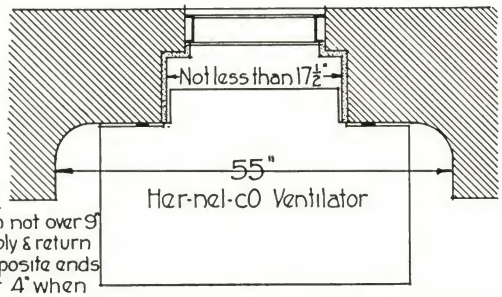


SHOWING VERTICAL WALL INTAKE



VERTICAL SECTION SHOWING APPROVED METHOD OF RECESSING

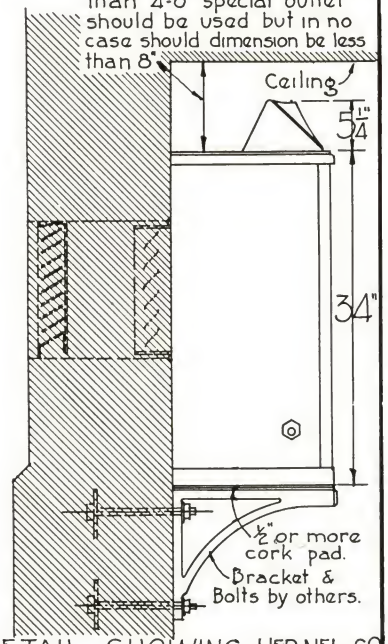
NOTE #1
Dimension not over 9" when supply & return are on opposite ends & not over 4" when supply & return are on same end.



HORIZONTAL SECTION THRU WALL INTAKE & SHOWING APPROVED METHOD OF RECESSING

It is advisable to build recess larger than cabinet as shown. If this cannot be done openings should be cased to insure neat fit.

When this dimension is less than 4'-0" special outlet should be used but in no case should dimension be less than 8"



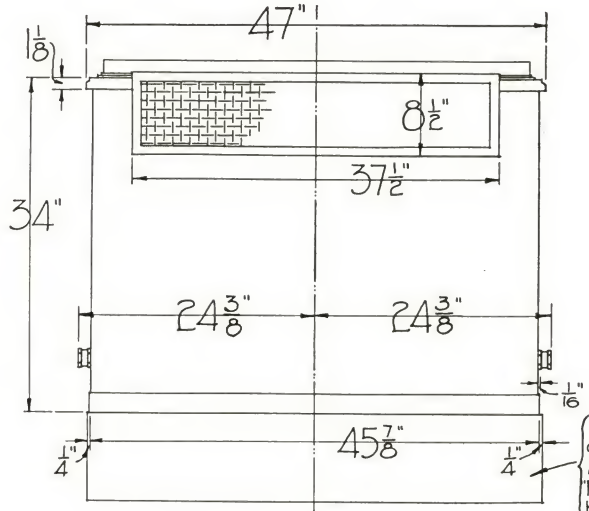
DETAIL SHOWING HER-NEL-CO VENTILATOR NEAR CEILING WITH SUPPORTING BRACKETS AND SPECIAL OUTLET

MODEL K DIMENSIONS

HER-NEL-CO VENTILATOR

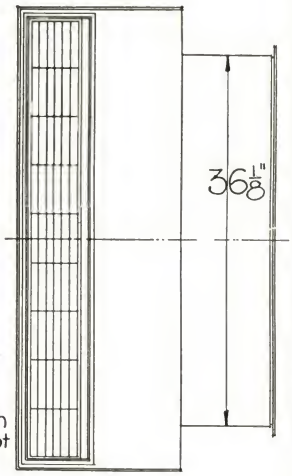
ARRANGED FOR AUTOMATIC CONTROL

FOR HAND CONTROL SEE MODEL J DIMENSION SHEET.

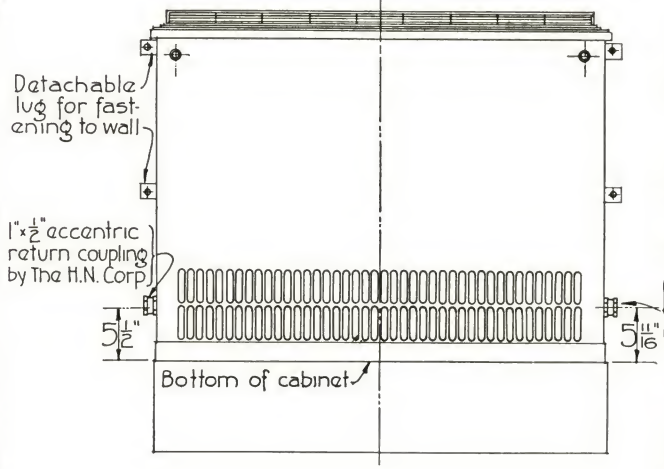


REAR ELEVATION

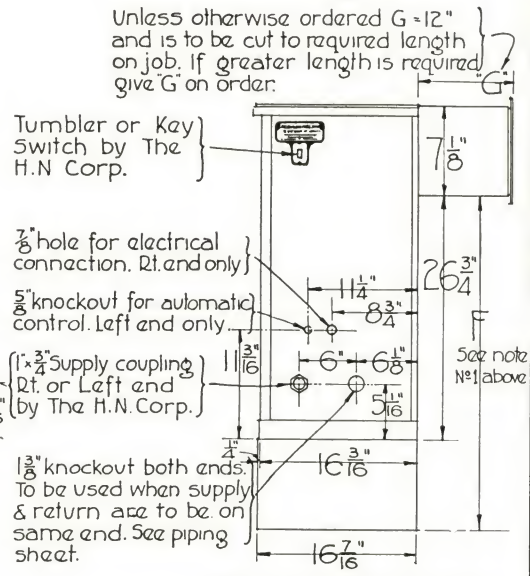
NOTE Nº 1
Sub bases furnished on special order only. Always give dimension "F" on order. F should not be more than 50"



PLAN

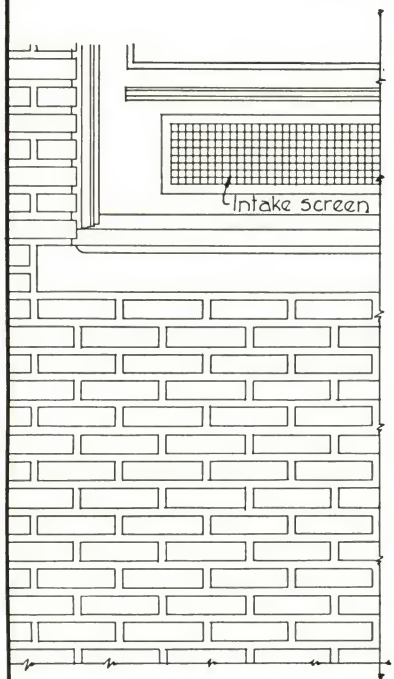


FRONT ELEVATION

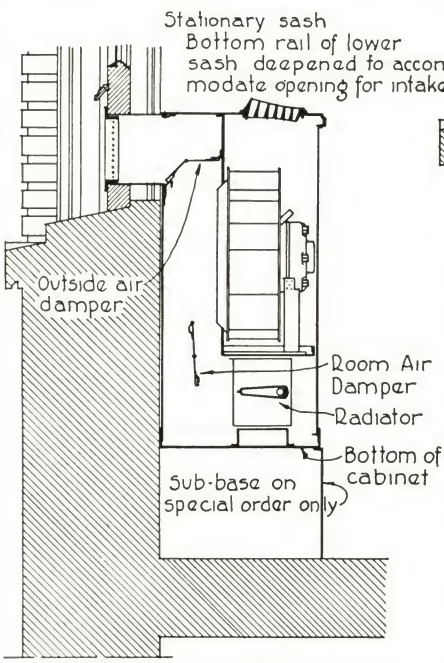


END ELEVATION

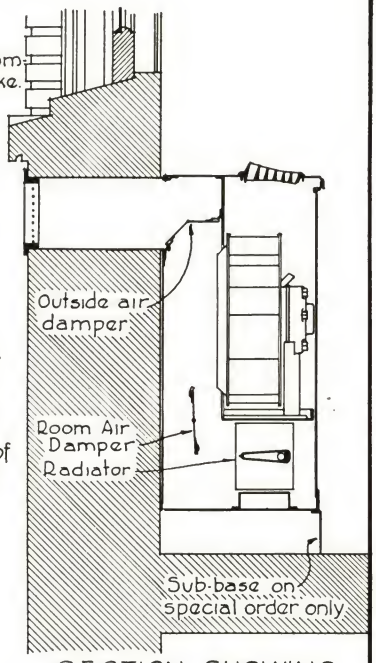
MODEL K APPLICATIONS
HER-NEL-CO VENTILATOR



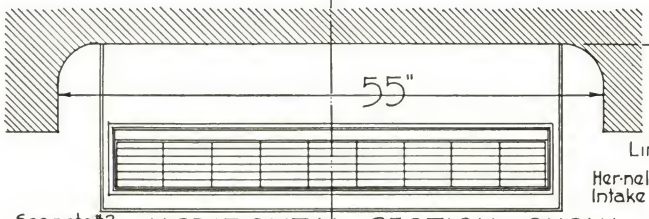
ELEVATION OF EXTERIOR SHOWING HER-NEL-CO VENTILATOR INTAKE



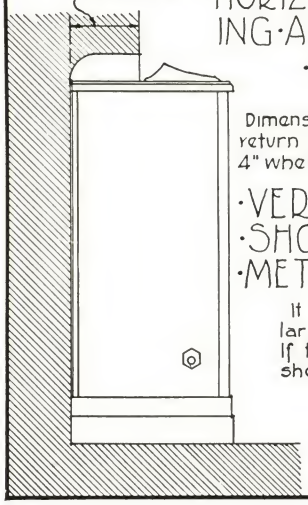
SECTION SHOWING HER-NEL-CO VENTILATOR WITH INTAKE THRU LOWER RAIL OF WINDOW SASH



SECTION SHOWING HER-NEL-CO VENTILATOR WITH INTAKE THRU WALL BELOW WINDOW SILL



HORIZONTAL SECTION SHOWING APPROVED METHOD OF RECESSING

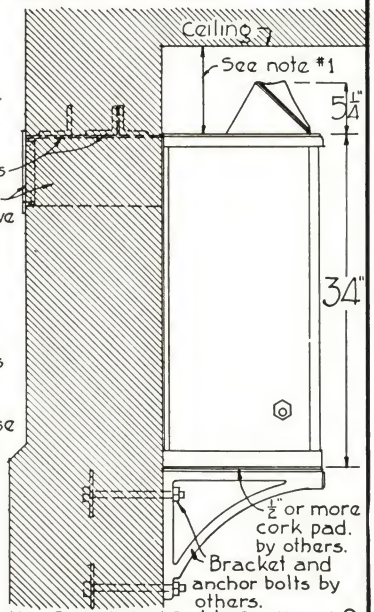


VERTICAL SECTION SHOWING APPROVED METHOD OF RECESSING

It is advisable to build recess larger than cabinet as shown If this cannot be done openings should be cased to insure neat fit

NOTE #2
Dimension not over 9" when supply & return are on opposite ends & not over 4" when supply & return are on same end.

NOTE #1
When the above dimension is less than 4'-0" special outlet should be used, but in no case should dimension be less than 8".



DETAIL SHOWING HER-NEL-CO VENTILATOR NEAR CEILING WITH SUPPORTING BRACKET AND SPECIAL OUTLET

How to Select Her-Nel-Co Ventilators

As outlined in the preceding section of this catalogue, the first requirement of good ventilation is the maintenance of a proper state of atmospheric activity. This can only be insured, in large occupied areas, such as school class rooms, by some well developed means of mechanical agitation. The Her-Nel-Co System of Ventilation employs the high velocity, vertical jet principle of air diffusion which, when properly applied, insures uniform atmospheric activity, without attendant drafts. This is the same method that has proved so successful with the well known Univent System of Ventilation. Experience has shown that the most agreeable and invigorating effect is obtained when the air is circulated at a rate of not less than five nor more than ten room volumes per hour. Therefore, the rule in selecting Her-Nel-Co Ventilators is as follows:

RULE

The rated air delivery capacity of the Her-Nel-Co Ventilator (or Ventilators), in c. f. m. should equal from $\frac{1}{12}$ to $\frac{1}{6}$ of the cubic contents of the room served.

For example, if the cubic contents of a class room is 8400 cu. ft., the Her-Nel-Co Ventilator should have a capacity of not less than 700 c. f. m.

The second requirement of good ventilation demands the introduction of sufficient outdoor air, when required, to remove excess body heat and odors due to occupancy. Obviously a system which depends entirely upon outdoor air for cooling has limitations and it is impossible to maintain a temperature of 70° F. in an occupied room when the outdoor temperture is 70° F. or more. As a matter of fact, it is impractical to do so when the outdoor temperature closely approaches 70° F. Under such conditions, the indoor temperature must be expected to rise unless refrigeration is employed. In the case of schools, which are not generally occupied in hot weather, and, in other cases where partial relief is desirable but the cost of refrigeration is not warranted, this limitation is not important. It is usually satisfactory, in schoolhouse practice, to maintain a temperature of approximately 70° F. so long as the outdoor temperature is below 60° F. In the exceptional cases, when it is higher than this, windows may be safely opened or some overheating may be endured without material discomfort.

Typical class rooms are usually so proportioned that an air change of five (5) to ten (10) room volumes per hour will provide from 17 to 34 c. f. m. of outdoor air per occupant, which insures comfort within practical limits.

The curves on the acompanying chart (see opposite page) show the outdoor temperature for which a room temperature of approximately 70° F. can be maintained in a fully occupied typical class room with various amounts of outdoor air per pupil.

As shown on the chart, 17 c. f. m. per pupil will maintain a room temperature of approximately 70° F. when the outdoor temperature is 59° F. without sun and 55° F. with intense sun. These conditions usually are satisfactory. Therefore, in most instances, the minimum rate of five (5) air changes per hour will satisfactorily fulfill the cooling requirement for good ventilation provided, however, a room is not receiving heat from adjoining boiler rooms or other sources.

When consulting the capacity table on page 15, it will be noted that the Her-Nel-Co Ventilator is listed with two heating capacities for each air delivery rating. The listed heating capacities are enough to take care of the average school class room in mild climates. In more severe climates and in severely exposed rooms in mild climates the use of supplementary direct radiation is assumed. Experience has demonstrated that it is not advisable to provide more heating capacity in the ventilating apparatus than is listed because the necessarily higher outlet temperatures mitigate against proper air diffusion. More heating capacity can easily be provided within the apparatus but the results will not be as satisfactory. In choosing between the two heating capacity ratings, where the total heating load is but slightly in excess of the larger, it is better to use the smaller rating with a larger direct radiator.

It should be kept in mind that no room can be properly ventilated unless it is properly heated. Consequently, care should be exercised to see that the combined heating capacity of the Her-Nel-Co Ventilator and supplementary radiation is sufficient to provide for the heat losses through the exposed surfaces and infiltration and for reheating. It is recommended that the heating load for heat transmission losses and infiltration be calculated in accordance with the rules of the A. S. H. & V. E. The infiltration with the Her-Nel-Co System of Ventilation is substantially the same as with direct radiation. With reference to the extra radiation to be provided for reheating we recommend the following formula:

$R_1 = (70 - t_0)\ C \div 13200.$

In this formula, C = cubic contents of room, t_0 = minimum outdoor temperature for which the system is to be designed, and, R_1 = extra sq. ft. of direct steam radiation (or equivalent) required for reheating. See examples, pages 24, 25 and 26.

The use of vent outlets of any kind in rooms to be ventilated with Her-Nel-Co Ventilators is not recommended. They are not necessary when supplying outdoor air and are a detriment when recirculating. Under no circumstances should an exhaust system be installed in connection with the Her-Nel-Co Ventilators unless it is to be used in warm weather only. If, in very unusual cases it should be found that the full amount of air cannot be delivered by the ventilator without a vent, sufficient relief will be afforded by providing a small opening in, or by slightly shortening a door leading into a corridor.

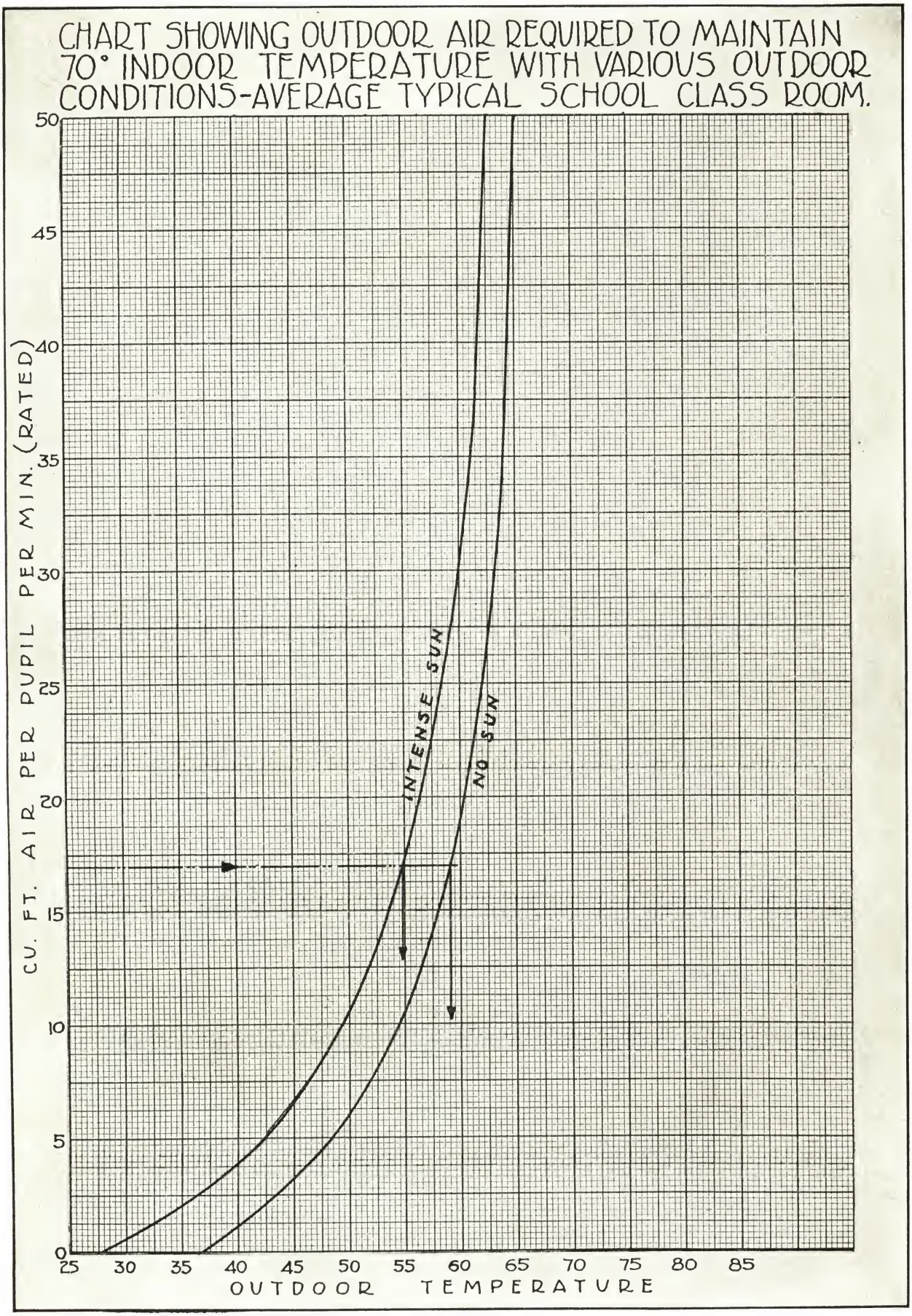


CHART SHOWING OUTDOOR AIR REQUIRED TO MAINTAIN 70° INDOOR TEMPERATURE WITH VARIOUS OUTDOOR CONDITIONS-AVERAGE TYPICAL SCHOOL CLASS ROOM.
CU. FT. AIR PER PUPIL PER MIN. (RATED)
0
5
10
15
20
25
30
35
40
45
50
INTENSE SUN
NO SUN
25 30 35 40 45 50 55 60 65 70 75 80 85
OUTDOOR TEMPERATURE

How to Apply Her-Nel-Co Ventilators

There are several principles underlying the proper application of the Her-Nel-Co System of Ventilation using Her-Nel-Co Ventilators.

First Principle

Use one or more Her-Nel-Co Ventilators for each room to be ventilated.

Each room or space should be provided with its own ventilating system, independent of the systems in all the other rooms or spaces, which provides properly controlled ventilation in keeping with the requirements of each individual space.

The use of one ventilator to serve two or more spaces defeats this principle by substituting group room control for unit room control.

Second Principle

Do not add duct extensions to the Her-Nel-Co Ventilator outlets because they interfere with proper air diffusion.

The air should be thoroughly diffused throughout the room by some properly developed method otherwise the proper degree of atmospheric activity will not be maintained and temperature stratification will lower the efficiency of the system. The vertical jet principle of air diffusion is employed in the Her-Nel-Co System of Ventilation. Anything that interferes with this jet such as an outlet duct will impair the effectiveness of the apparatus.

Third Principle

All Her-Nel-Co Ventilators should be installed in such a manner that they may be easily and quickly inspected and cleaned.

Partial recessing, as illustrated on pages 17 and 19, may be accomplished without jeopardizing the accessibility of the system but full recessing or concealment is not recommended.

It has been our experience that whenever apparatus of this character is fully recessed or concealed it is not given the proper care. Full recesses provide dirt collecting spaces and if the machines are not readily accessible they will not receive proper attention.

Fourth Principle

The location of the Her-Nel-Co Ventilator on an outside wall is preferred.

However, if the supplementary radiators represent at least one-half of the total heating capacity and are located under windows, the Her-Nel-Co Ventilators may be located on inside walls. See page 26.

It is preferred to locate Her-Nel-Co Ventilators on outside walls for the following reasons:

(a) The piping is simplified because the ventilator and supplementary radiation will all be on the same wall.

(b) No flues of any kind are required, resulting in considerable saving in space and building costs.

(c) Outdoor air is drawn directly into the ventilator at outdoor temperature, whereas, air drawn through ducts is subject to a temperaure rise of several degrees before entering the ventilator and will therefore be less effective for cooling purposes.

On the other hand, locating ventilators on inside walls eliminates wall intakes and in a very few instances this may be considered desirable. If located on inside walls, each Her-Nel-Co Ventilator should be supplied with an independent duct extended out-of-doors in the most direct manner. The ducts should be smooth and have not less than 30 sq. in. of net cross sectional area for each 100 c.f.m.

Fifth Principle

Her-Nel-Co Ventilators should be located at good distribution centers and not in a corner of the room.

This principle requires little discussion. It is self-evident that more uniform diffusion can be expected if the ventilators are centrally located.

Sixth Principle

The Her-Nel-Co Ventilator should be located where it will be exposed to view.

Psychology plays a part in ventilation. People appreciate it more if they observe the process of ventilation. For this reason the Her-Nel-Co Ventilator should be located where it will be exposed to view and where its operation will be obvious to the casual observer.

Seventh Principle

Vent outlets are rarely required.

It is true that all the outdoor air pushed into the room by the Her-Nel-Co Ventilator when cooling is required must leave the room in some way or other. However, contrary to common conception it is rarely necessary to provide openings or apertures to serve this purpose.

Experience has demonstrated that vents are seldom required because the excess air easily finds its way out through cracks and crevices around windows and doors. Moreover, it has been shown that the distribution is far better where there are no vents.

Basement or Ground Floor Rooms

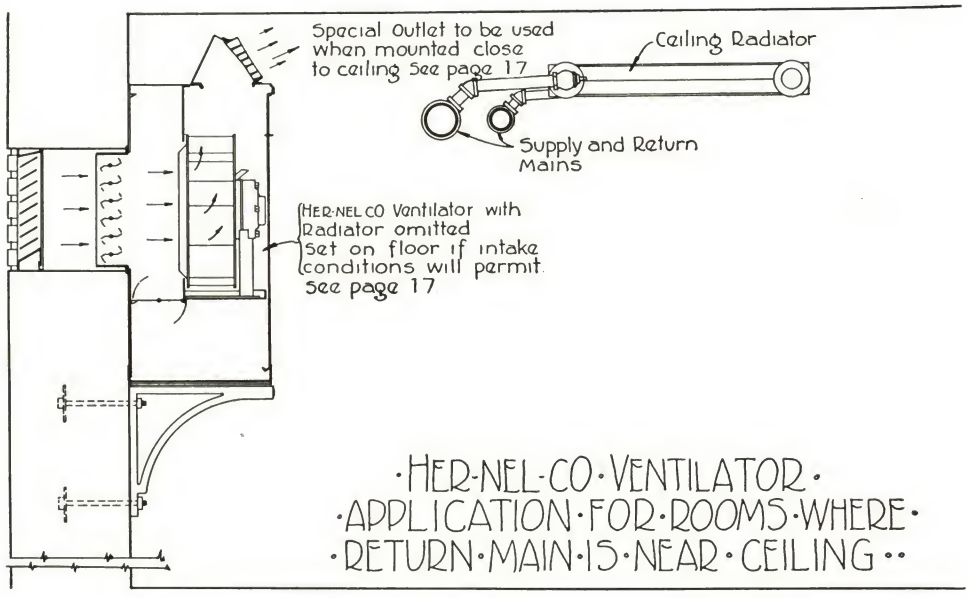
Difficulty may be encountered in applying Her-Nel-Co Ventilators to basement or ground floor rooms. If the grade level outside the building is higher than the basement floor level some special means must be employed to admit air to the Her-Nel-Co Ventilator. The most obvious way of acomplishing this is to locate the ventilator high enough on the wall to permit the use of the Model "J" machine as shown on page 17. Under some conditions it may be preferable to use the Model "K" as shown on page 19 in the same manner.

Where it is not practical to locate the intake within the room it may be necessary to place the Her-Nel-Co Ventilator on an inside wall with a duct extended to a suitable point of intake. This duct should be as smooth and direct as possible and have at least 30 sq. in. of net cross sectional area for each 100 c.f.m.

As a rule, the return piping is low enough to permit the Her-Nel-Co Ventilators in the basement rooms to be piped in the standard manner. However, in instances where the return piping is too high, special arrangements become necessary. A careful study of the principles of the Her-Nel-Co System of Ventilation will disclose the fact that the radiator may be omitted from the ventilator without impairing the effectivness of the system providing sufficient direct radiation is installed in the room to take care of the heating and reheating load. Therefore, when piping difficulties require it, the Her-Nel-Co Ventilator may be installed as shown below with the radiator omitted.

Existing Buildings

There are many existing buildings that are adequately heated but which are not properly ventilated. In many such cases it is an easy matter to apply the Her-Nel-Co System of Ventilation because it does not require any extra capacity in the chimney, or boiler, and the same system of piping which serves the direct radiation can be made to serve the Her-Nel-Co Ventilators.



Notes on School Application

As previously explained, the Her-Nel-Co Ventilator should be selected to have sufficient capacity to circulate the air in any room at the rate of not less than five nor more than ten room volumes per hour.

The room served should be provided with sufficient heating capacity to take care of the transmission losses, infiltration and reheating loads.

Class Rooms

In class rooms that are proportioned to the number of occupants in the usual way, it will be found that an air supply based on a rate of circulation of five room volumes per hour will provide approximately 17 c.f.m. per occupant, which is usually satisfactory, as explained on page 20.

In the average class room in cold climates it will probably be found that supplementary radiation will be required to adequately provide for the heating load because of the limitations placed upon the heating capacity in the ventilators in the interests of good ventilation. In the average class room in milder climates, and in smaller class rooms, in colder climates, supplementary radiation may not be required. Examples of the selection of the Her-Nel-Co Ventilators for two typical class rooms will be found on pages 24 and 25.

Study Rooms, Lecture Rooms, etc.

Study rooms, lecture rooms, etc., should be treated as large class rooms. On page 26 a typical study hall application is illustrated. It should be noticed that in this application the Her-Nel-Co Ventilators are located on the inside walls as discussed on page 22.

Other Large Rooms

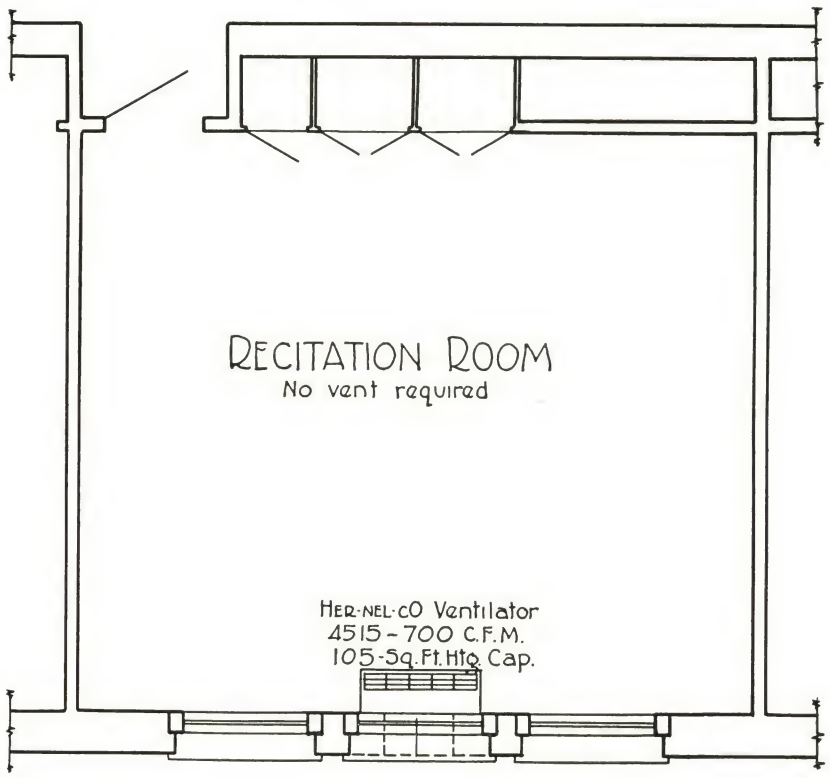
Manual arts rooms, shops, physical laboratories, gymnasiums, auditoriums and other large rooms where no injurious or obnoxious fumes are released should be ventilated in the same manner as class rooms. In this character of space the ratio of cubic contents to occupants is usually high. As a result, the air capacity required to circulate the air in a room at the rate of five volumes will usually provide more than 17 c.f.m. per occupant. In rooms of this kind the duration and frequency of the periods of occupancy by the individual pupil does not, from a health standpoint, render ventilation as important as in class rooms, although, from a pure comfort standpoint, ventilation may be more necessary during the periods of occupancy than in class rooms.

Therefore, while ventilation is not considered as important in an auditorium as in a class room, it is highly desirable.

Selection of Her-Nel-Co Ventilator
SMALL RECITATION ROOM (70° F.)

0° F. Assumed Outdoor Temperature.

Prevailing Winds—Northwest. Room Exposure—East.



Physical Data

One wall exposed—heated space above and below.
Dimensions—21 × 18 × 12 ft. = 4536 cu. ft.
Total window opening = 105 sq. ft.
Windows—double hung, wood sash, weather stripped.
Lineal ft. of weather stripped crack = 81.
Outside wall—13 in. brick furred with metal lath and plaster.
Net exposed wall area = 147 sq. ft.

Selection of the Ventilator

1. DETERMINATION OF AIR DELIVERY REQUIRED.

Minimum air delivery (5 room volumes per hour) $= \frac{4536}{12} = 378$ c.f.m.

Maximum permissible air delivery (10 room volumes per hour) $= \frac{4536}{9} = 756$ c.f.m.

One (1) Her-Nel-Co Ventilator, having the minimum air delivery of 700 cu. ft. of air per minute will be satisfactory because it will circulate the air within the range of five (5) to ten (10) room volumes per hour. A lower air capacity could be used, but 700 c.f.m. is the lowest permissible air delivery of the Her-Nel-Co Ventilator. See page 15.

2. HEATING CAPACITY REQUIRED.

Heat losses based on 0° to 70° F. with 15 mile wind—A. S. H. & V. E. 1930 Guide.

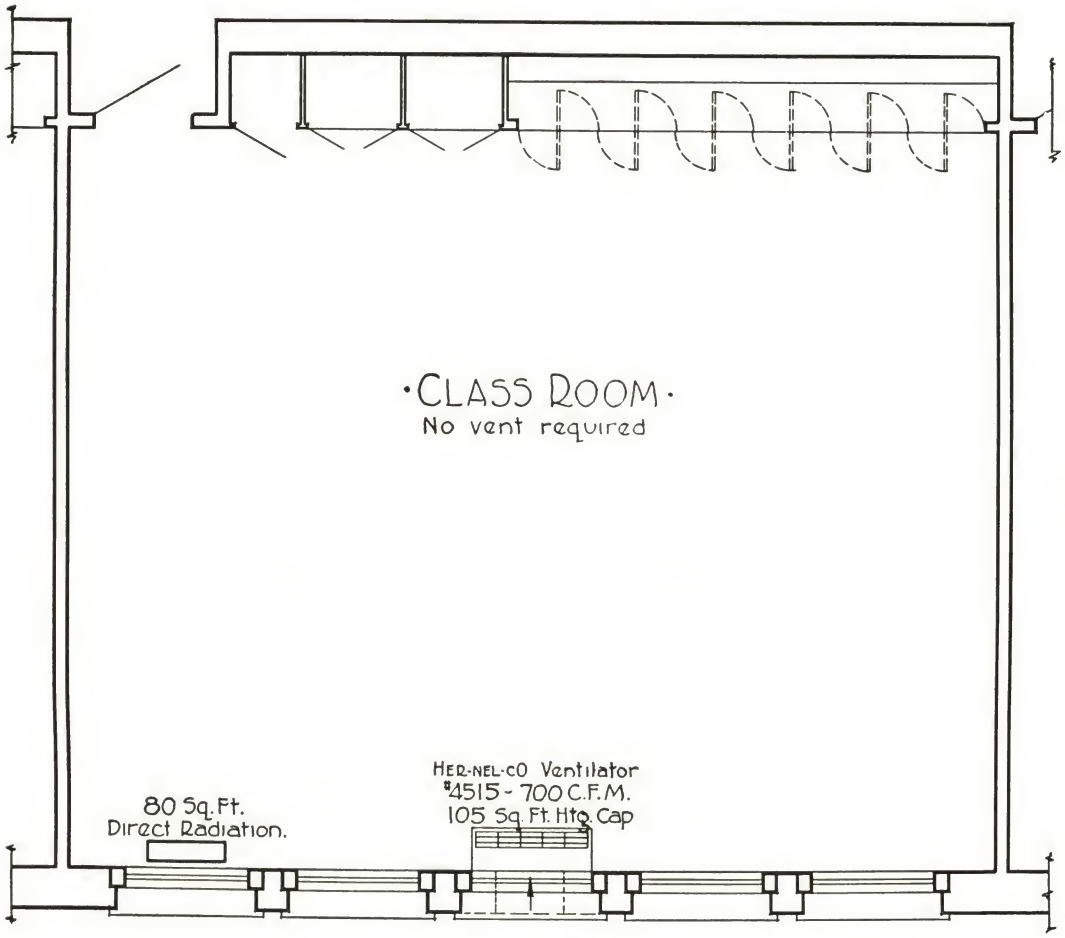
Windows	105 × 1.13 × 70	÷ 240	= 34.6 sq. ft.	equivalent direct radiation	
Wall	147 × .216 × 70	÷ 240	= 9.3 sq. ft.	"	"
Infiltration	81 × 29.1	÷ 240	= 9.8 sq. ft.	"	"
Additional capacity for quick heating	$\frac{4536 \times 70}{13200}$		= 24.1 sq. ft.	"	"
		TOTAL	= 77.8 sq. ft.	equivalent direct radiation	

Heating capacity of No. 4515 Her-Nel-Co Ventilator.... = 105 sq. ft.

No supplementary radiation is required and the surplus capacity in the machine selected is in no way objectionable.

Selection of Her-Nel-Co Ventilator
TYPICAL CLASS ROOM (70° F.)

0° F. Assumed Outdoor Temperature.
Prevailing Winds—Northwest. Room Exposure—West.



Physical Data

One wall exposed—heated space below—exposed ceiling.
Dimensions—23 × 29 × 12 ft. = 8338 cu. ft.
Total window opening = 177 sq. ft.
Windows—double hung, wood sash, weather stripped.
Lineal feet of weather stripped crack = 137.
Outside wall—13 in. brick furred with metal lath and plaster.
Net exposed wall area = 186 sq. ft.
Ceiling—5 in. concrete slab with ½ in. insulation and suspended ceiling.
Net exposed ceiling area = 667 sq. ft.

Selection of the Ventilator

1. DETERMINATION OF AIR DELIVERY REQUIRED.

Minimum air delivery (5 room volumes per hour) $= \frac{8338}{12} = 695$ c.f.m.

Therefore one (1) Her-Nel-Co Ventilator, having an air delivery of 700 cu. ft. or air per minute will be satisfactory.

2. HEATING CAPACITY REQUIRED.

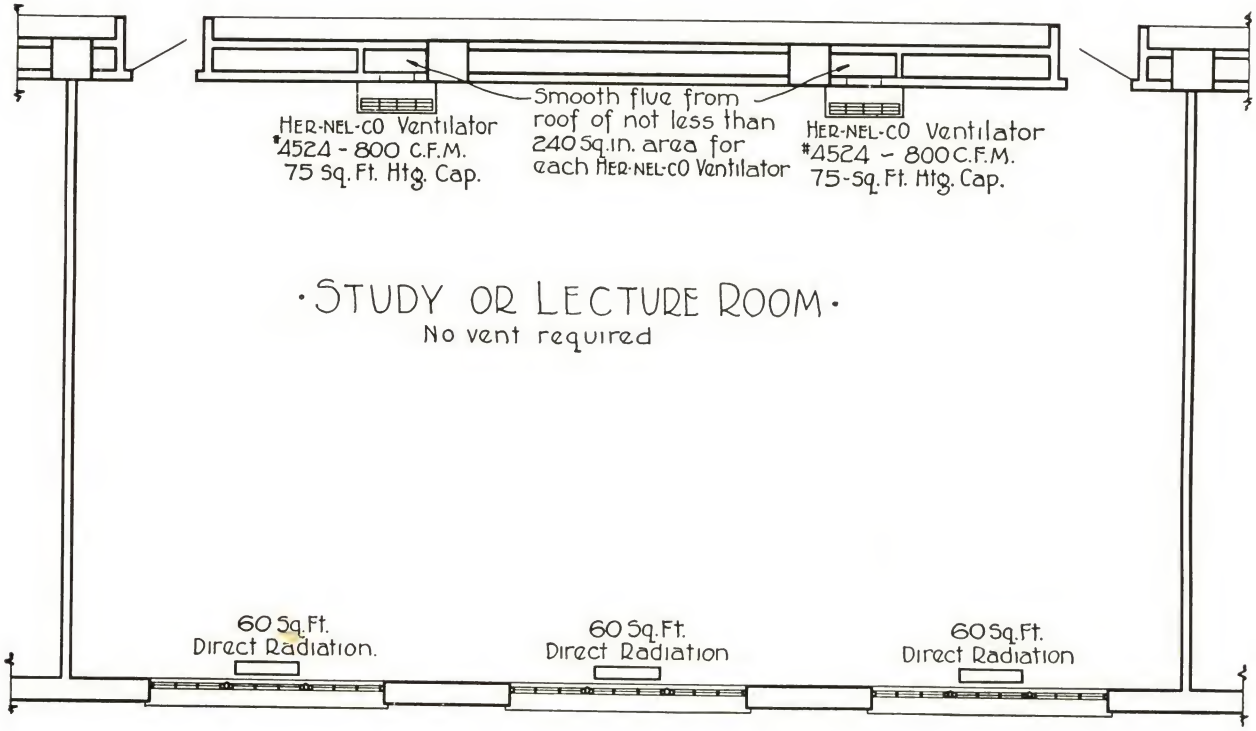
Heat losses based on 0° to 70° F. with 15 mile wind—A. S. H. & V. E. 1930 Guide.

Windows	177 × 1.13 × 70 ÷ 240	= 58.4 sq. ft.	equivalent direct radiation
Wall	186 × .216 × 70 ÷ 240	= 11.7 sq. ft.	" " "
Infiltration	137 × 29.1 ÷ 240	= 16.6 sq. ft.	" "
Total of above		86.7 sq. ft.	equivalent direct radiation
Allowance for windward exposure (15%)		= 13.0 sq. ft.	" " "
Ceiling	667 × .216 × 70 ÷ 240	= 42.0 sq. ft.	" " "
Additional capacity for quick heating	$\frac{8338 \times 70}{13200}$	= 44.2 sq. ft.	" " "
	TOTAL	= 185.9 sq. ft.	equivalent direct radiation
Heating capacity of Her-Nel-Co Ventilator No. 4515		= 105.0 sq. ft.	
Supplementary radiation required		= 80.9 sq. ft.	
Supplementary radiation installed		= 80. sq. ft.	

Note. In this case larger sizes of machines could be used if desired, as follows:
No. 4525 with 70 sq. ft. supplementary radiator. No. 4535 with 65 sq. ft. supplementary radiator.

Selection of Her-Nel-Co Ventilator
TYPICAL STUDY OR LECTURE ROOM (70° F.)

0° F. Assumed Outdoor Temperature.
Prevailing Wind—West. Room Exposure—West.



Physical Data

One wall exposed—heated space above and below.
Dimensions—28 × 50 × 12½ ft. = 17500 cu. ft.
Total window opening = 280 sq. ft.
Windows—steel sash, not weather stripped.
Lineal feet of crack = 114.
Outside wall—17 in. brick furred with metal lath and plaster.
Ceiling—6 in. concrete slab with 2 in. cork insulation and suspended ceiling.
Net exposed ceiling area = 1400 sq. ft.
Net exposed wall area = 345 sq. ft.
Assume that it is desired to locate the Her-Nel-Co Ventilators on the inside wall.

Selection of the Ventilator

1. DETERMINATION OF AIR DELIVERY REQUIRED.

Minimum air delivery (5 room volumes per hour) $= \frac{17500}{12} = 1458$ c.f.m.

Therefore two (2) Her-Nel-Co Ventilators having an air delivery of 800 cu. ft. of air per minute each, totaling 1600 c.f.m. will be satisfactory.

2. HEATING CAPACITY REQUIRED.

Heat losses based on 0° to 70° F. with 15 mile wind—A. S. H. & V. E. 1930 Guide.

Windows	280 × 1.13 × 70 ÷ 240 =	92.2 sq. ft.	equivalent direct radiation
Wall	345 × .184 × 70 ÷ 240 =	18.6 sq. ft.	" " "
Infiltration	114 × 111 ÷ 240 =	52.7 sq. ft.	" " "
Total of above	=	163.5 sq. ft.	equivalent direct radiation
Allowance for windward exposure (15%)	=	24.5 sq. ft.	" " "
Ceiling	1400 × .101 × 70 ÷ 240 =	41.3 sq. ft.	" " "
Additional capacity for quick heating	$\frac{17500 \times 70}{13200}$ =	92.8 sq. ft.	" " "
TOTAL	=	322.1 sq. ft.	equivalent direct radiation
Heating capacity of Two Her-Nel-Co Ventilators No. 4524 = 2 × 75	=	150 sq. ft.	
Supplementary radiation required	=	172.1 sq. ft.	equivalent direct radiation
Supplementary radiation installed	3 × 60 =	180 sq. ft.	equivalent direct radiation (should not be less than ½ of total load)

Since the Her-Nel-Co Ventilators are to be located on the inside wall, it is advisable to install one supplementary radiator under each group of windows. Outdoor air should be supplied to each Her-Nel-Co Ventilator by an individual flue, of not less than 240 sq. in. net area, based on 30 sq. in. per 100 c.f.m.

Temperature Regulation

Drafts in cold weather and overheating in mild weather have caused more annoyance and discomfort in school class rooms than all other atmospheric conditions combined. Accurate temperature control is the essence of the science and the crux in the art of ventilation. The manner in which this problem is met in the Her-Nel-Co System of Ventilation is an outstanding achievement and a great improvement over most, if not all, systems, heretofore offered.

Drafts are avoided through the admission of only as much outdoor air as is actually required for the removal of excess heat and odors, the thorough mechanical intermixture of this air with recirculated air prior to delivery and a high velocity, vertical delivery that insures complete and uniform diffusion in the room. In very severe weather, when drafts are most annoying and most liable to occur in conventional practice, little or no outdoor air is required or delivered by this system and no difficulty is involved. In normal weather more outdoor air is admitted but it is completely intermixed with sufficient recirculated air within the fan wheel to insure delivery at a uniform mild temperature without cold spots. In warmer weather when the full supply of fresh air is needed, there is little danger from drafts and by reason of the manner in which the air is delivered in the form of a jet to the ceiling, there are none.

Overheating is minimized because, as soon as weather conditions are such as to permit of overheating, all artificial heating sources are completely shut off and outdoor air, which is at a lower temperature than that indoor, is delivered directly into the upper region of the room for cooling purposes.

Automatic Temperature Regulation Is Recommended

The various operations by which the Her-Nel-Co System of Ventilation affords accurate temperature control of the room atmosphere, under different conditions, is fully illustrated and described in the first section of this catalog (pages 10 and 11). As stated therein, the system may be entirely manually or automatically operated but in either event, the various steps are mechanically co-ordinated and regulation is comparatively simple. The use of a first-class system of automatic temperature regulation is always recommended with any heating and ventilating system for schools. In this manner, all elements of control are taken care of at all times, without personal attention. With the improvements which have been made in automatic temperature regulation equipment and the simple mechanical construction of the Her-Nel-Co Ventilator, the liability for any trouble with automatic temperature control is negligible, while the advantages through its use are pronounced. The Her-Nel-Co System of Ventilation can be properly controlled by any of the well known systems of automatic temperature regulation and requires no special equipment. An intermediate thermostat, valves on the direct radiators and the radiator in the ventilator, together with a single damper control motor are all that are needed in the way of room equipment.

For manual control the entire cycle of operations in the Her-Nel-Co Ventilator is covered through the single movement of a dial located on the right hand end of the cabinet as illustrated on page 12. In this case, however, it is necessary to regulate any direct radiators independently. Since the latter are only used in severe weather and for reheating, this offers no serious complication. There is no hesitation in fully recommending manual control because of any shortcomings in the equipment, but rather because it may be difficult if not impossible for busy teachers to give it proper attention.

In connection with the subject of temperature regulation, it should be pointed out that a first-class vacuum or vapor system of steam circulation is much to be preferred to either gravity steam or hot water. Where accurate control is important, neither of the latter is sufficiently flexible or responsive to afford as dependable regulation as the more modern types of steam systems. However where special vapor or vacuum systems are employed in connection with ventilating equipment, it has been found more satisfactory to carry pressures slightly above atmosphere.

In the case of gravity steam systems, an intermediate action of the valve controlling the supply to the radiator is not practical and, therefore, it is necessary to provide for a lag in operation, which prevents securing the same economy in fuel as is provided where this lag is not necessary. The Her-Nel-Co Ventilator is adaptable to gravity steam systems and can be adjusted to provide for the lag mentioned above but, in view of the greater economy of vacuum and vapor systems and their slight additional cost, the latter are strongly recommended.

As an additional refinement in control, the use of Herman Nelson Invisible Radiators (see pages 79 to 86) or equivalent type is recommended in preference to cast iron radiators wherever supplementary radiators are necessary. The invisible radiators add a little to the cost, but they are more responsive to temperature control and have other advantages which commend them for this class of work.

Finally, it should be realized that comfort cannot be insured in any room if the system of steam circulation is improperly designed or operated, if insufficient heating capacity is provided, or, if the building is very poorly constructed. Therefore, these elements should receive the careful attention of the architect and engineer. On the other hand, uncovered steam pipes, floors over boiler rooms, etc., may render temperature control ineffective. Care should be exercised that no uncontrollable sources of heat shall interfere with proper temperature control.

Wiring Data

Method

The method of wiring recommended for Her-Nel-Co Ventilator motors is the same as that recommended for any standard motor. Due to their special electrical characteristics, Her-Nel-Co single phase motors may be connected to the several phases of a two or three phase service as shown below. Where Her-Nel-Co Ventilators are used it is recommended that circuits, independent of the lighting system, be provided. It is advisable on large jobs to provide a separate circuit for each group.

Electrical wall outlets should be installed at each Her-Nel-Co Ventilator close to the floor and at the right-hand end of the cabinet, as one stands facing it. Connections between such wall outlets and the cabinets should be in rigid, flat, or flexible conduits.

Her-Nel-Co Ventilator motors are furnished for the following current characteristics:

Type of current	Number of phases	Frequency	Voltage	Code word	Approx. amperes per lead
Alternating	1	25	110	Macar	3.10
			220	Macho	1.55
		30	110	Macle	2.00
			220	Maize	1.00
		50	110	Maleo	2.60
			220	Malic	1.30
		60	110	Malva	2.20
			220	Mango	1.10

Note: The above data will be found useful in determining wire, switch and fuse sizes, etc.

Wire Sizes

All Her-Nel-Co Ventilator motors should be wired as shown below. All wires should be so sized that the maximum voltage drop at the last motor on the line does not exceed 3 volts.

Switches

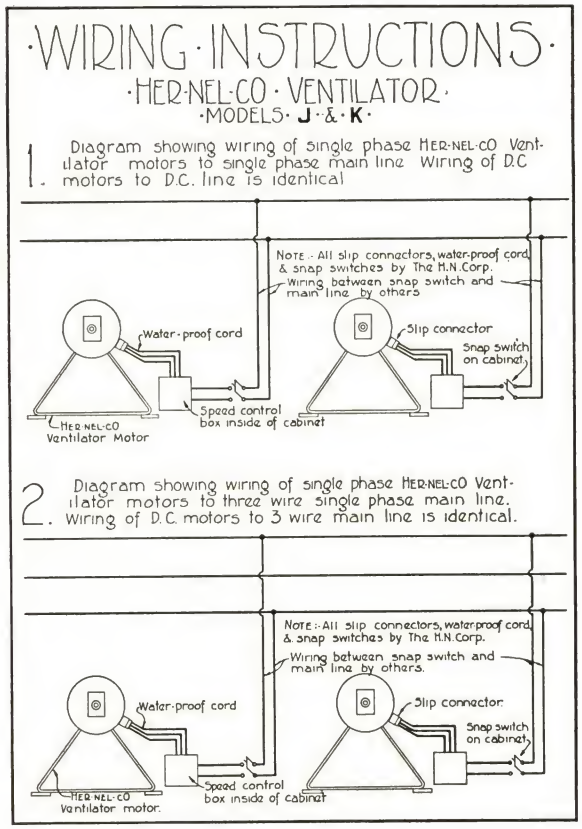
When ordered for hand control, the electrical switch is incorporated in the hand control equipment. When ordered for automatic temperature control, all cabinets are provided with flush type key switches to start and stop the motor as shown on page 18. Tumbler switches are provided on special order.

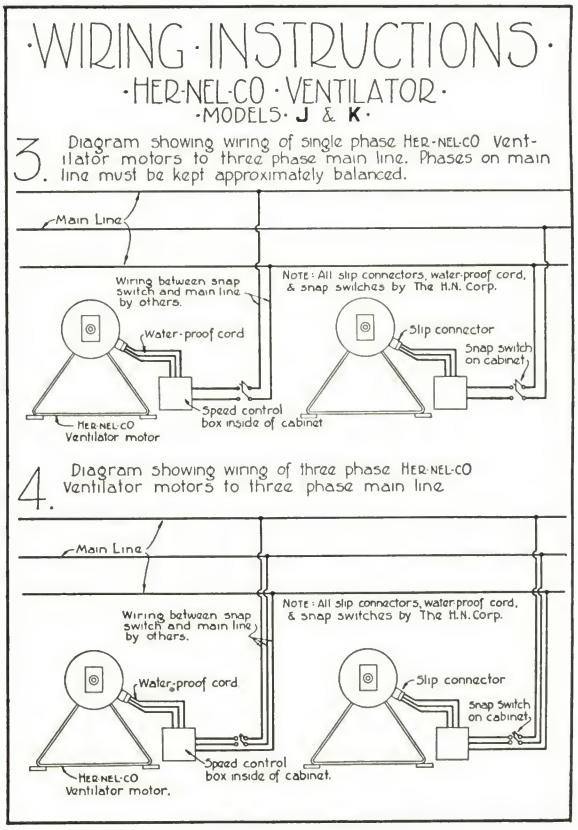
Speed Adjustment

All Her-Nel-Co Ventilator motors are of the adjustable speed type and are shipped from the factory with the approximately correct speed adjustment. Full instructions are furnished with each motor.

Approvals

The Her-Nel-Co Ventilator is approved by the National Board of Fire Underwriters of the United States and the Hydro Electric Power Commission of Ontario, Canada.





Piping Suggestions

In general, Her-Nel-Co Ventilators are piped exactly the same as radiators having the same heating capacity.

Supply Valves and Tappings

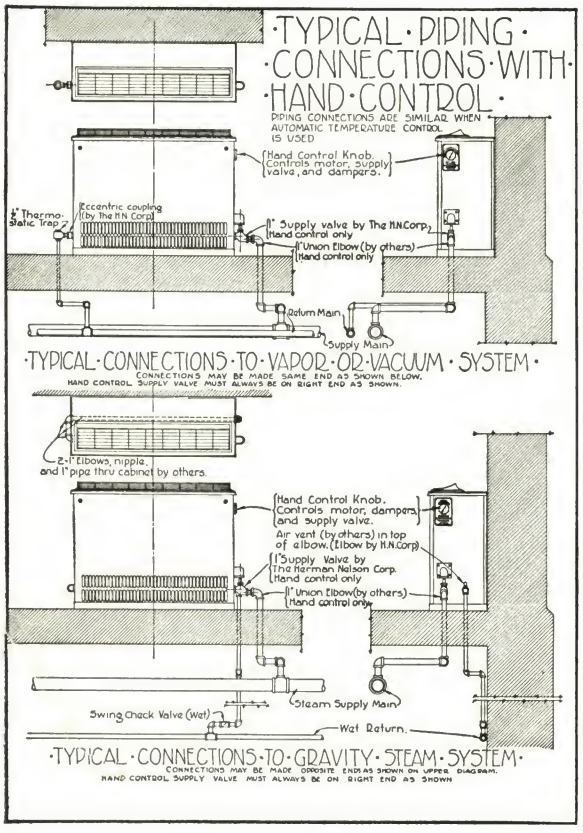
When ordered for hand control, for any type of system, Her-Nel-Co Ventilators are provided with a 1-in. angle valve of the straightway type, with female inlet connection as shown on page 16. The Her-Nel-Co Ventilator is shipped with this valve installed on the radiator ready for pipe connections as shown below.

When ordered for automatic temperature control the above valve is omitted and a coupling is provided with a ¾-in. female thread for vapor or vacuum system. See page 18. A ¾-in. diaphragm valve is recommended in order to make it possible to throttle the steam supply as required.

Return Tappings

When ordered for vapor or vacuum systems a return coupling with a ½-in eccentric female tapping is provided.

When ordered for gravity steam or hot water systems a 1-in. elbow with air vent tapping is provided. In the case of a gravity steam system a ⅛-in. interval vent pipe should be installed to remove the air from a point below the bottom of the Herman Nelson Radiator core. The contractor should install an air vent in this tapping. Vacuum type air vents are recommended.



For hot water systems no internal pipe is required. The contractor should install a hand or automatic air vent in the vent tapping.

Location of Connections

All Her-Nel-Co Ventilators are shipped with the supply connection on the right end and return connection on the left end, as one stands facing them. Knockouts are provided in the cabinet making it possible to have both connections on the right end, with the supply connection in front. This change should be made on the job. When automatic temperature control is used the supply connections can be changed on the job to the left end with the return connection on the right end or both can be on the left end. This change cannot be made with the hand control.

Vapor and Vacuum Systems

For vapor and vacuum systems the traps may be of the thermostatic or combination float and thermostatic type.

Gravity System

When connected to a gravity system all Her-Nel-Co Ventilators should have two pipe connections even though all other radiators on the job have one pipe connection. Care should be taken to provide a tight check valve in each return connection located at the lowest possible point.

Hot Water Systems

Where hot water systems are used with the Her-Nel-Co Ventilator, forced circulation should be employed as gravity systems are not recommended.

Humidifiers

Unless otherwise ordered, all Her-Nel-Co Ventilators are equipped with humidifiers which consist of a nozzle installed behind the Herman Nelson Radiator. This nozzle is connected to a tapping in the Herman Nelson Radiator through a needle valve and check valve. The amount of steam used for humidifying can be regulated by adjusting the needle valve. The check valve prevents air from entering the radiator whenever the steam pressure of the radiator is below atmospheric. When humidifiers are used it is advisable to slightly increase the boiler size and to provide automatic water feeders. It is evident that where humidifiers are used pressures above atmosphere should be carried.

Piping, Valve and Trap Sizes

All piping, valves and traps should be sized on the basis of the heating capacities given on page 15, for the air delivery and radiator selected.

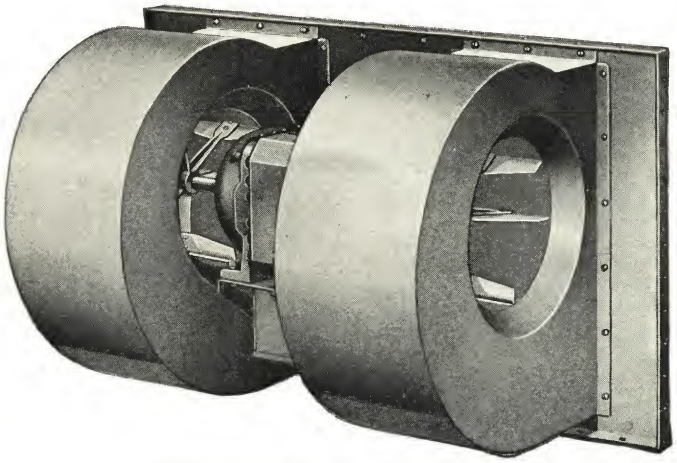
THE HER-NEL-CO MAGNAVENT

The Her-Nel-Co System of Ventilation is not limited in its application to a specific type of equipment. It is *an idea* which broadly covers any means* whereby air from either or both of two sources—one warm and the other cool—is delivered into a room according to the thermal demands of that room. It may be applied to large rooms such as gymnasiums, auditoriums, etc., by using a number of Her-Nel-Co Ventilators—the apparatus hereinbefore described, which is a portable and self-contained machine especially adapted to school class rooms—but frequently the large amount of floor space required makes this solution impractical. The Her-Nel-Co Magnavent equipment has been developed to meet this condition.

*Note: U. S. Letters Patent No. 1,753,156 and No. 1,753,157 issued April 1, 1930.

Use of the Her-Nel-Co Magnavent

The Her-Nel-Co Magnavent is a blower and fan assembly arranged to obtain the maximum capacity, with quiet operation, in a minimum of space. It is used in conjunction with a group of Herman Nelson Wedge Core Heating Elements, or Radiators (described on pages 2 and 3), and mixing dampers, arranged to apply the Her-Nel-Co System of Ventilation to the room to be ventilated, as shown below and on pages 36 and 37.



The Her-Nel-Co Magnavent

The Her-Nel-Co Magnavent is less expensive than an equivalent number of Her-Nel-Co Ventilators, and has certain practical advantages, but it is not quite as effective as an equivalent number of properly distributed units of the other type.

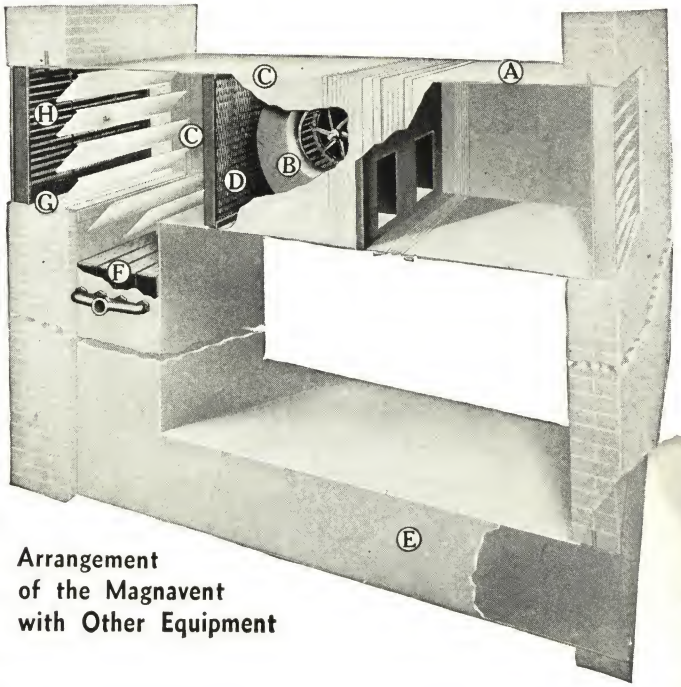
Arrangement

The Her-Nel-Co Magnavent is normally arranged to discharge horizontally but, on special order, may be arranged to discharge up or down as shown on page 36.

The illustration at the right shows the general method by which the Her-Nel-Co Magnavent may be employed. The precise arrangement of the various pieces of equipment and the air chambers and conduits may be varied to meet a number of conditions, providing, however, that certain essentials are observed:

(1) An air discharge conduit (A) of ample size must be extended from the discharge side of the Her-Nel-Co Magnavent (B) to the room served. This conduit may be of sheet metal or other suitable materials and should be long enough to constitute an expansion chamber but not so long and tortuous as to set up unnecessary resistance. This conduit should terminate in an outlet into the room, located well above the breathing line and equipped with a suitable grille or deflector. The latter is illustrated and recommended since it directs the air stream toward the ceiling of the room.

(2) The Her-Nel-Co Magnavent should be properly supported and enclosed in a suitable suction chamber (C). This chamber may be formed of sheet metal or other suitable materials and should be readily accessible. It is desirable to place an air filter (D) in this chamber in such a manner that all the air passing through the equipment will be cleaned.



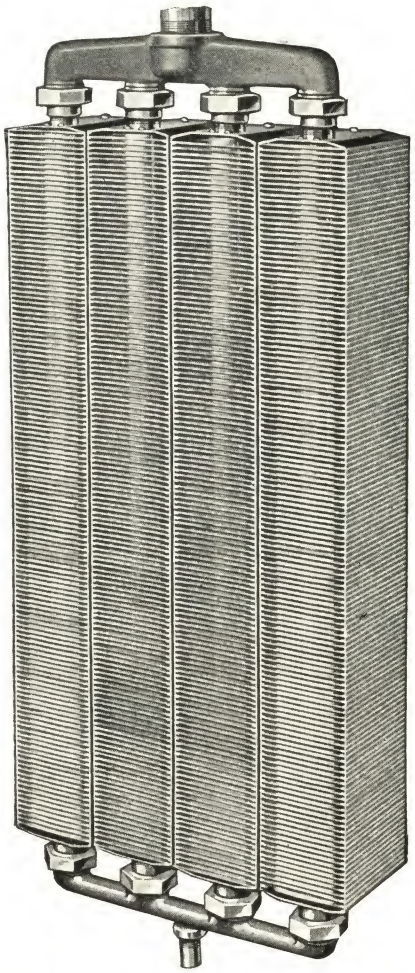
Arrangement of the Magnavent with Other Equipment

3. An indoor air conduit (E) of ample size should be extended from a point at the floor line of the room served and connected to the suction chamber (C). This conduit may be formed of sheet metal or other suitable materials and a grille should be provided at the inlet. A Herman Nelson Wedge Core Radiator (F) of proper capacity and a tight closing, easily operated control damper should be placed in this conduit in convenient locations. It is generally desirable to place the damper at the point where the conduit connects to the suction chamber.

4. An outside air conduit (G) of ample size should be extended from some suitable point and connected to the suction chamber (C). It should be equipped with a weather-proof air intake (H) at the entrance and a tight-closing, easily operated control damper at some suitable point—usually where the conduit connects with the suction chamber.

5. Means should be provided for controlling the steam supply to the radiator and also for operating the control dampers from the two sources of air supply in such a manner that one damper opens as the other damper closes. Automatic temperature regulation is highly desirable for this type of equipment but mechanical means can be arranged so that the dampers may be operated manually.

THE HERMAN NELSON CORPORATION regularly furnishes the Her-Nel-Co Magnavent, the Herman Nelson Wedge Core Radiators, the air intake, and the air filters required for installations of this character, but all other equipment, together with the air conduits and chambers must be provided by the contractor in accordance with specifications of the architect or engineer.

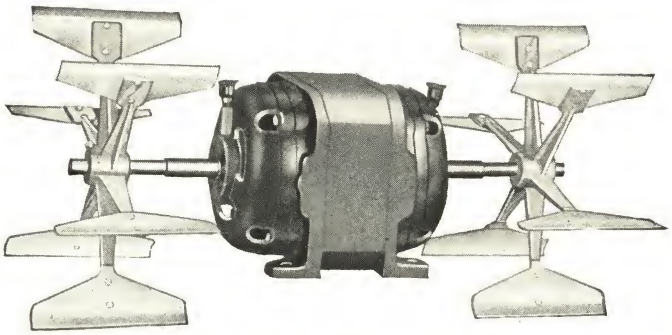


A Group of Herman Nelson Wedge Core Radiators

Made in Two Series

Each Magnavent is made in two series, the 200 series and the 350 series as shown on page 33. Each series is rated at several air deliveries. These variations in air deliveries are obtained by varying the motor speed.

Each Magnavent, regardless of whether it is the 200 or 350 series, should be used in conjunction with one or more groups of No. 0 Herman Nelson Wedge Core Radiators having not less than 5, and not more than 6, linear inches of radiation per 100 c.f.m. For example, a 358 Magnavent having a rating of 5000 c.f.m. should be used with 250 to 300 linear inches of radiation. Likewise a 356 Magnavent having a rating of 4000 c.f.m. should be used with from 200 to 240 linear inches of radiation. Complete data on the Herman Nelson Wedge Core Radiators is given on page 34.



Fan and Motor Assembly

If less radiation is used than recommended on preceding page, the heating capacity and the maximum air delivery will be reduced. On the other hand, if more radiation is used, the outlet temperature becomes too high for good diffusion. For this reason it is essential that the radiation be selected within the above limits. It is also essential that special radiator recommendations be obtained whenever the steam temperature exceeds 227° F.

The exact form in which the radiation is used depends upon the local conditions and the space available for the installation. For this reason extreme care should be taken to carefully specify the exact arrangement desired.

If no particular arrangement is called for, the following will be shipped:

Size of Magnavent	Air Delivery C.f.m.	Number of sections	Length of each section, in.	Total linear inches
205	2000	4	30	120
206	2500	5	30	150
207	3000	6	30	180
355	3500	6	35	210
356	4000	6	40	240
357	4500	6	45	270
358	5000	6	50	300

In all cases the header arrangements will be as shown on page 34.

Control

The Magnavent may be arranged to be controlled by hand or by any of the well known temperature control systems and for use on vapor, vacuum, gravity steam or hot water systems. When controlled by hand, chain markers and instruction plates are furnished by The Herman Nelson Corporation. As will be explained later, all Magnavent equipment is the same regardless of the type of heating system or type of control used.

Motors

All motors are of the adjustable speed type to obtain varying air deliveries and may be furnished for all the more usual current characteristics. Speed variation is obtained by means of the Her-Nel-Co Speed Controller which is mounted in a substantial steel case and has two adjustment knobs, both of which are provided with limit stops and indicators.

Single Phase Her-Nel-Co Speed Controller

Filters

Filters as shown on page 35 are always recommended but may or not be used depending on local conditions. As shown on page 35, 20x25-in. filter units are used. Two units are furnished for the 200 series Magnavent and four units for the 350 series.

Intakes

Magnavent intakes are similar in construction and appearance to the Her-Nel-Co Ventilator. As shown on page 35 two sizes of Magnavent intakes are furnished, one for the 200 series and one for the 350 series. All Magnavent intakes are heavily cadmium plated and finished with brown weather-resisting paint.

Other Equipment

Adjustable deflectors arranged to direct the air toward the ceiling are recommended as shown on pages 38 and 39. These deflectors are not furnished by The Herman Nelson Corporation.

An expansion chamber at least 36 in. long in the case of the 200 series and 48 in. long in the case of the 350 series should be provided between the Magnavent and the air outlets. In cross section this expansion chamber should be the same size as the Magnavent suspension board as shown on page 33.

It should be carefully noted that for each Magnavent installation, The Herman Nelson Corporation furnishes the following appaartus:

The Magnavent
The Herman Nelson Wedge Core Radiators
The Magnavent Wall Intake (Optional)
The Magnavent Filter (Optional)
Chain Markers and Instruction Plates (Hand control only)

All other equipment, including grilles, deflectors, expansion chamber, dampers, duct work, chain controls, etc., is furnished by others.

CAPACITIES OF HER-NEL-CO MAGNAVENT SERIES 200 AND SERIES 350

Number	Code Word	C.f.m. (Varies with fan speed)	Length of H.N. Wedge Core Radiator required in inches	Heating capacity, sq. ft.
205	Vital	2000	100 to 120	205 to 230
206	Vives	2500	125 to 150	255 to 285
207	Vivid	3000	150 to 180	305 to 345
355	Vizor	3500	175 to 210	345 to 380
356	Vocal	4000	200 to 240	395 to 435
357	Voile	4500	225 to 270	440 to 490
358	Volta	5000	250 to 300	490 to 545

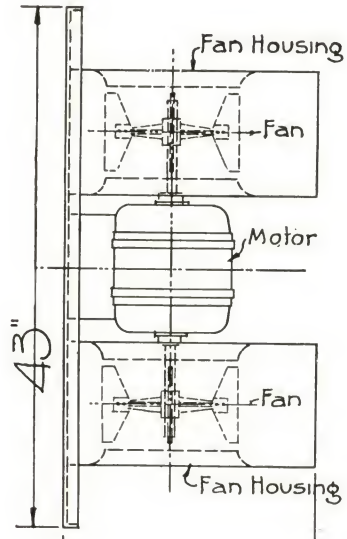
Notes

Each Magnavent should be accompanied by the amount of Herman Nelson Wedge Core Radiator shown in the fourth column. The heating capacities for these minimum and maximum amounts of radiation are given in the fifth column.

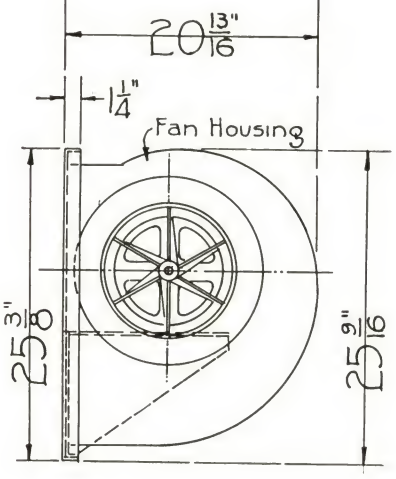
Heating capacities are given in sq. ft. of equivalent direct radiation and are based on a room temperature of 70° F. and steam temperature 218° F.

Where 25 cycle current is used, the 207 and 358 Magnavents cannot be furnished.

MAGNAVENT · DIMENSIONS ·

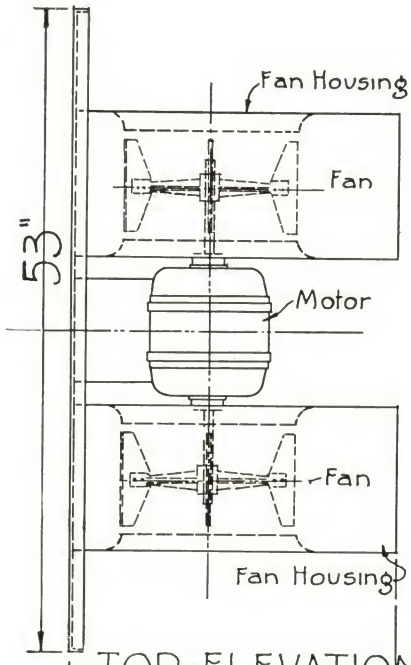


· TOP · ELEVATION ·



· END · ELEVATION ·

· 200 · SERIES ·



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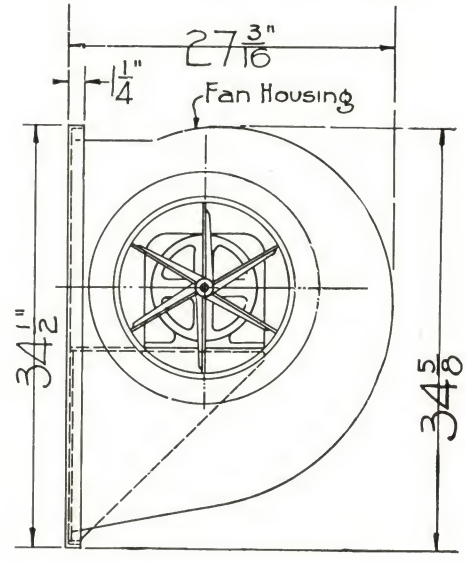
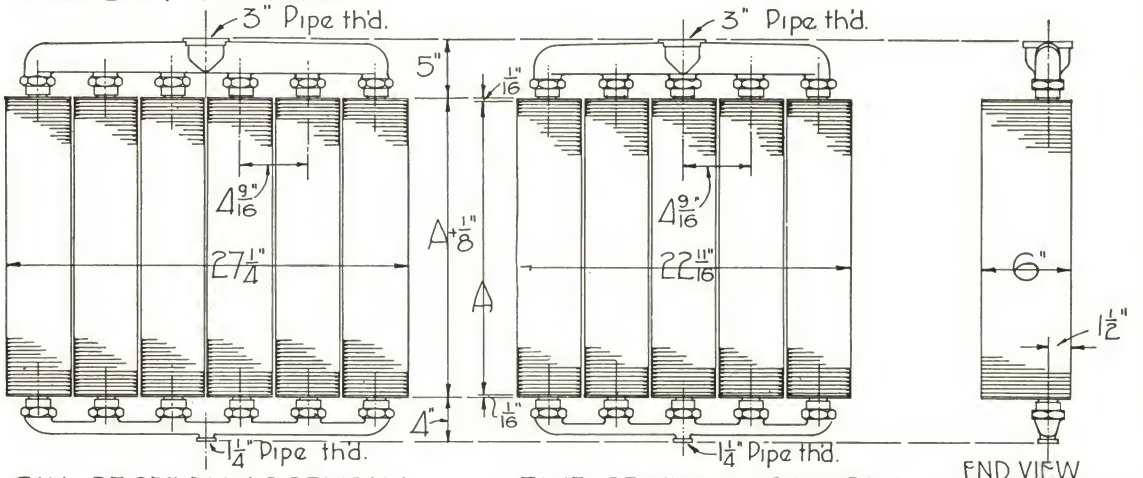


· END · ELEVATION ·

· 350 · SERIES ·

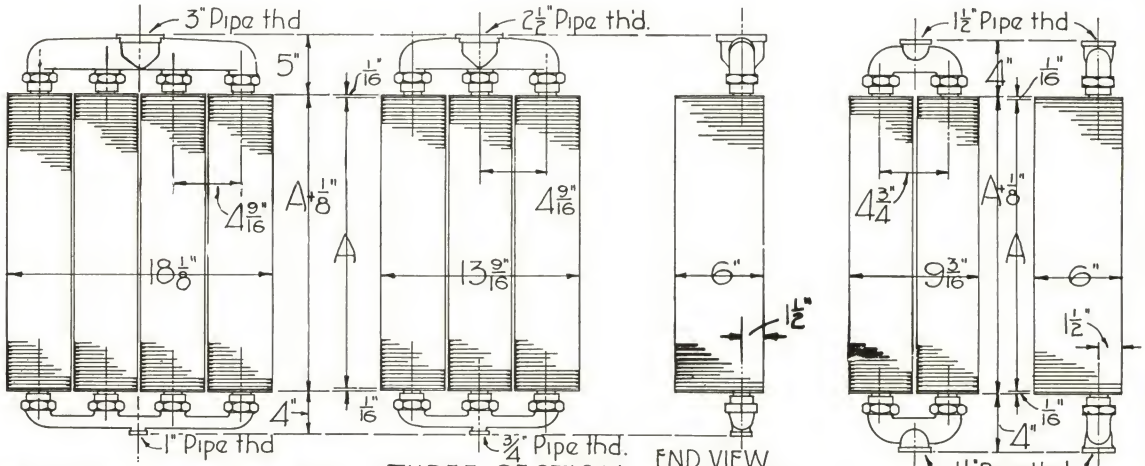
DIMENSIONS OF STANDARD HERMAN NELSON WEDGE CORE RADIATOR ASSEMBLIES



SIX SECTION ASSEMBLY
n = 6

FIVE SECTION ASSEMBLY
n = 5

END VIEW FIVE & SIX SECTION ASSEMBLY



FOUR SECTION ASSEMBLY
n = 4

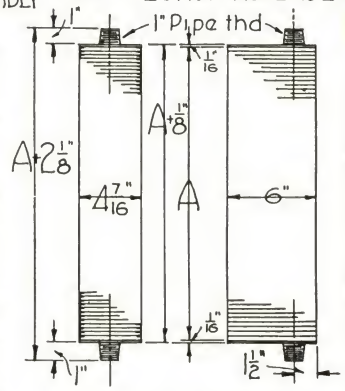
THREE SECTION ASSEMBLY
n = 3

END VIEW THREE & FOUR SECTION ASSEMBLY

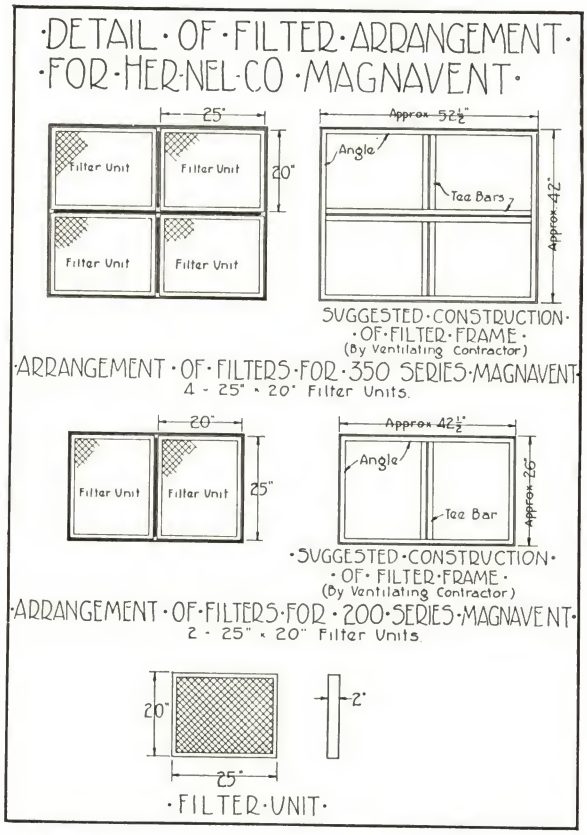
TWO SECTION ASSEMBLY

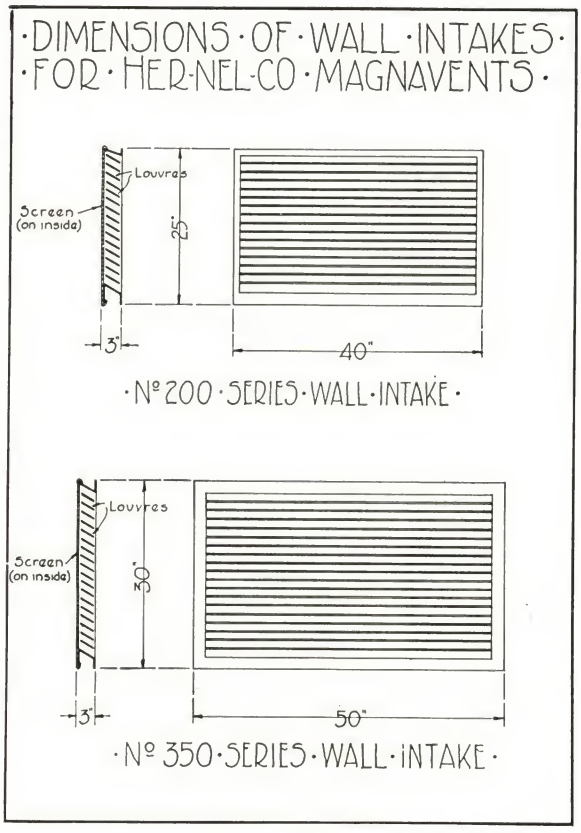
LINEAL INCHES OF RADIATION FOR VARIOUS COMBINATIONS OF HERMAN NELSON WEDGE CORE RADIATORS.

No. OF SECTIONS = n	LENGTH OF SECTION = "A"								
	15	20	25	30	35	40	45	50	55
1	15	20	25	30	35	40	45	50	55
2	30	40	50	60	70	80	90	100	110
3	45	60	75	90	105	120	135	150	165
4	60	80	100	120	140	160	180	200	220
5	75	100	125	150	175	200	225	250	275
6	90	120	150	180	210	240	270	300	330



SINGLE SECTION





Selection and Application of the Her-Nel-Co Magnavent

The Her-Nel-Co Magnavent should be selected on exactly the same basis as the Her-Nel-Co Ventilator as explained on page 20, namely, to circulate the air in the room at a rate of not less than five (5) nor more than ten (10) room volumes per hour.

There are several principles underlying the proper application of the Magnavent for individual rooms. The first two principles are the same as given on page 22 for the HER-NEL-CO Ventilator as follows and, therefore, do not require further explanation.

First Principle

Use one or more Magnavents for each room to be ventilated.

Second Principle

Install all Magnavents in such a manner that they may be easily and quickly inspected and cleaned.

Third Principle

Locate the Magnavent as low as possible and use adjustable deflectors in the discharge opening, arranged to direct the air upward.

Deflectors and discharge grilles should have a free area of 24 sq. in. per 100 c.f.m. Due to the fact that a large volume of air is introduced at one point, care should be taken to allow the discharged air sufficient time to thoroughly mix with the air in the room by locating the Magnavent as low as possible and directing the air upwards.

Fourth Principle

The duct work should be as short and direct as possible with a minimum number of turns and a minimum area of 24 sq. in. per 100 c. f. m.

These areas are recommended because it is essential that the resistance of the ducts, etc., be kept at a practical minimum in order to avoid reducing the air delivery.

Fifth Principle

The room air should be recirculated from the floor through a grille having a free air area of 24 sq. in. per 100 c. f. m.

The air should be drawn into the duct work at the floor in order to thoroughly mix the air in the room.

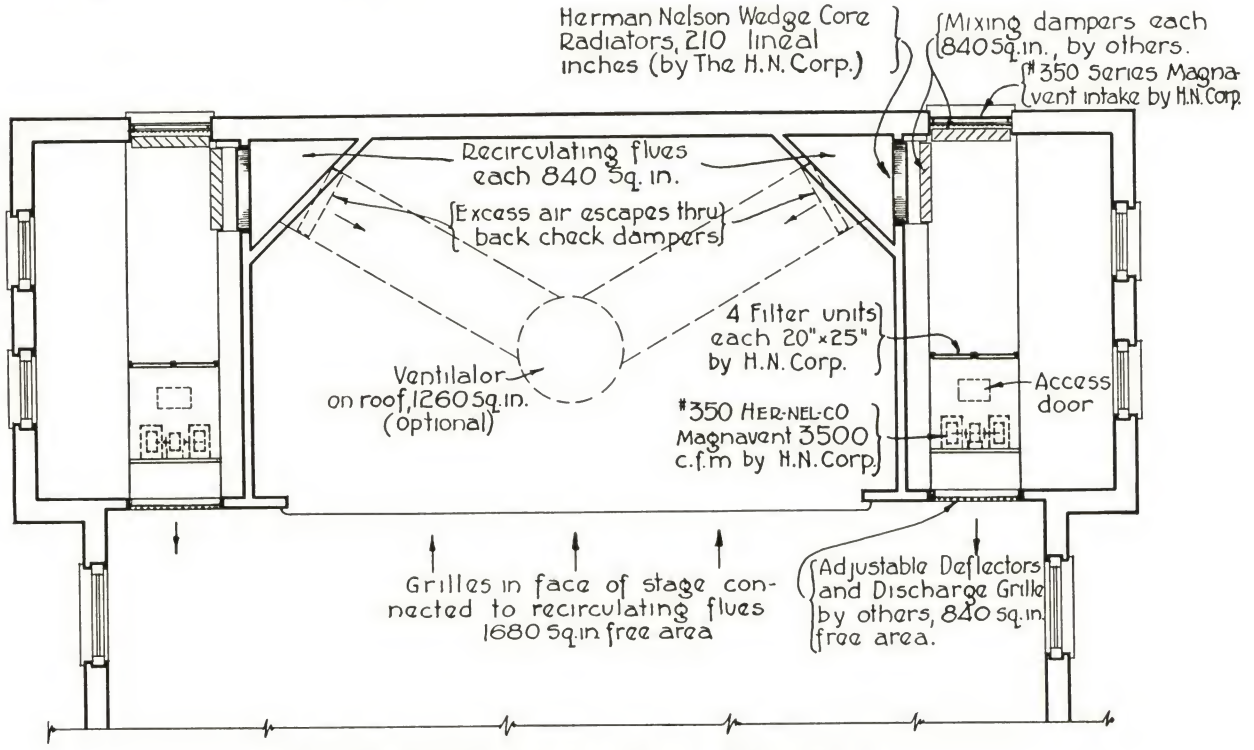
Sixth Principle

Vent flues usually are not required but in the case of exceptionally tight rooms they may be desirable.

Such vents should have a maximum free area of 18 sq. in. per 100 c. f. m. and should be provided with back check dampers or pneumatic dampers operated in conjunction with the outdoor dampers. In class rooms and similar rooms where there is a large amount of opening around windows and doors as compared to the maximum amount of outdoor air introduced, it is not necessary to provide vents. However, in some larger rooms where the amount of opening around doors and windows is small as compared to the maximum amount of outdoor air introduced, considerable pressure may be built up in the room causing the doors to stand open, etc. For this reason, it is sometimes advisable to provide vent flues equipped with back check dampers to relieve this pressure.

Selection of Her-Nel-Co Magnavents
TYPICAL AUDITORIUM (70° F.)

Prevailing Wind—North | 0° F. Assumed Outdoor Temperature | Room Exposure—East, South and West



Physical Data

Both walls and the stage exposed—heated space below—roof above.
Dimensions—40 × 80 × 20 ft.
Contents, including stage = 73000 cu. ft.
Total window opening = 640 sq. ft.
Windows—wood sash, not weather stripped.
Lineal feet of crack = 560.
Outside wall—13 in. brick furred with metal lath and plaster.
Net exposed wall area = 3645 sq. ft.
Ceiling—4 in. concrete—suspended ceiling.
Net exposed ceiling area = 3800 sq. ft.

Selection of the Magnavents

1. DETERMINATION OF AIR DELIVERY OF MAGNAVENTS.

Minimum air delivery (5 room volumes per hour) $= \frac{73000}{12} = 6083$ c.f.m.

Therefore, two (2) 350 Series Voluvents, having a total air delivery of 2 × 3500 or 7000 c.f.m. will be required.

2. DETERMINATION OF HEATING CAPACITY.

Heat losses based on 0° to 70° F. with 10 mile wind—A. S. H. & V. E. 1930 Guide.

Windows	640 × 1.13 × 70 ÷ 240 =	211 sq. ft.	equivalent direct radiation
Walls	3645 × .216 × 70 ÷ 240 =	230 sq. ft.	" " "
Infiltration	560 × 107 ÷ 240 =	250 sq. ft.	" " "
Ceiling	3800 × .334 × 70 ÷ 240 =	370 sq. ft.	" " "
Allowance for quick heating	$\frac{73000 \times 70}{13200}$ =	387 sq. ft.	" " "
	TOTAL =	1448 sq. ft.	equivalent direct radiation
Heating capacity of two No. 355 Magnavents, delivering 3500 c.f.m., with 210 lineal inches of Herman Nelson Wedge Core Radiators, each = 2 × 380.... =		760 sq. ft.	equivalent direct radiation
Supplementary radiation required.....		688 sq. ft.	equivalent direct radiation

3. INSTALLATION DATA (FOR EACH MAGNAVENT).

Wall Intake Size—50 × 30 in.
Filters—four units, each 20 × 25 in.
Herman Nelson Wedge Core Radiators required. Use six (6) 35-in. sections, having a total length of 210 in. for each Magnavent.
Free area of discharge grille, adjustable deflectors, room air grille, duct work and mixing dampers $= \frac{3500 \times 24}{100} = 840$ sq. in.
Free area of ventilator (if used) and duct work..... $= \frac{2 \times 3500 \times 18}{100} = 1260$ sq. in. (for both Magnavents)

Two (2) No. 200 Series Magnavents might be selected to deliver 3000 c.f.m. In this case the heating capacity of each Magnavent would be 345 sq. ft. instead of 380 sq. ft. Under these conditions the supplementary radiation would be increased to 758 sq. ft., but the Herman Nelson Wedge Core Radiators, duct work, grilles, dampers, etc., could be reduced.

Typical Application

On page 36 will be found a typical Magnavent application in a small auditorium worked out in keeping with the above recommendations. Other large rooms, including gymnasiums, assembly rooms, etc., should be treated in a similar manner.

Existing Buildings

Existing buildings that are heated with radiators may be easily equipped with the Her-Nel-Co System of Ventilation. The Her-Nel-Co Magnavent may be installed complete with the Herman Nelson Wedge Core Radiators and connected to the existing piping. In this case, some of the existing radiation may be removed.

Or, if desired, the Magnavent may be installed without the Herman Nelson Wedge Core Radiators as explained for the Her-Nel-Co Ventilator on page 23. In this case, the Magnavent has no heating capacity and the existing radiators should be left in place. In either case, no change need be made in the boilers or piping if they are of sufficient size for good heating results, and no additional fuel is required. As explained in the case of the Her-Nel-Co Ventilator on page 23, the effectiveness of the Her-Nel-Co System is not impaired by this change.

In either case, the control cycles are the same as explained on pages 10 and 11.

Temperature Control

The cycle employed with automatic control is more economical than the one employed with hand control. For this reason, and because of its greater accuracy, automatic control is recommended.

When the Magnavent installation is to be controlled automatically, a damper motor should be arranged to operate the outdoor and room air dampers and a diaphragm valve should be installed on the Herman Nelson Wedge Core Radiators, as shown on page 39. With automatic temperature control the cycle of operation is in every way similar to that explained for the Her-Nel-Co Ventilator.

It should be carefully noted that the mixing dampers are not supplied by THE HERMAN NELSON CORPORATION but should be furnished as a part of the automatic temperature control equipment.

With manual control the outdoor and room air dampers should be furnished by the ventilating contractor, complete with chain controls located where they may be readily operated. See page 38. The chain markers and a combination instruction plate and chain holder are furnished by THE HERMAN NELSON CORPORATION. The markers should be carefully located on the chain. Marker "R" should be at the low point when the room air damper is wide open and marker "O" should be at the low point when the outdoor damper is wide open.

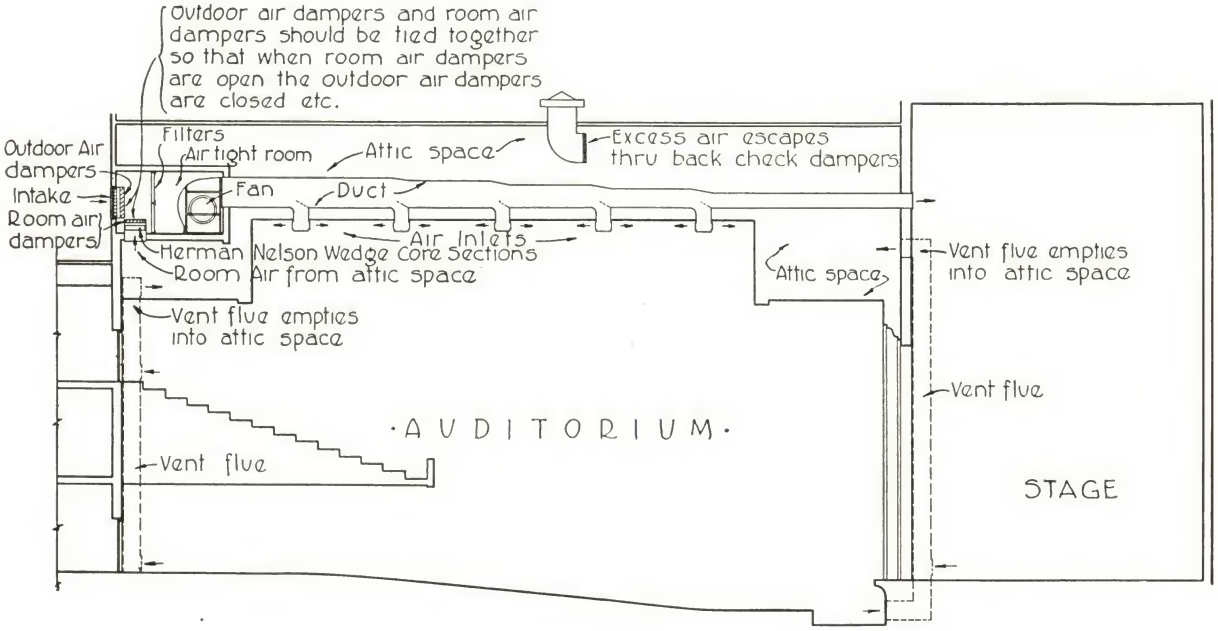
The method of controlling the Magnavent installation manually is the same for all types of heating systems.

Large Auditoriums, Etc.

As explained on page 30, the Her-Nel-Co System of Ventilation is not limited to any specific application or type of equipment. It is a patented idea which broadly covers any means for accomplishing the results outlined in the first section of this catalogue.

Two general types of equipment—the Her-Nel-Co Ventilator and Magnavent—are manufactured by THE HERMAN NELSON CORPORATION to apply the Her-Nel-Co System of Ventilation. It is clearly recognized that some rooms are too large, or so arranged, that it is impractical to ventilate them with either of these two types of equipment. For such applications, a duct system, as shown in the illustration below, is recommended. Such a system should be arranged to operate as explained for the Her-Nel-Co Magnavent.

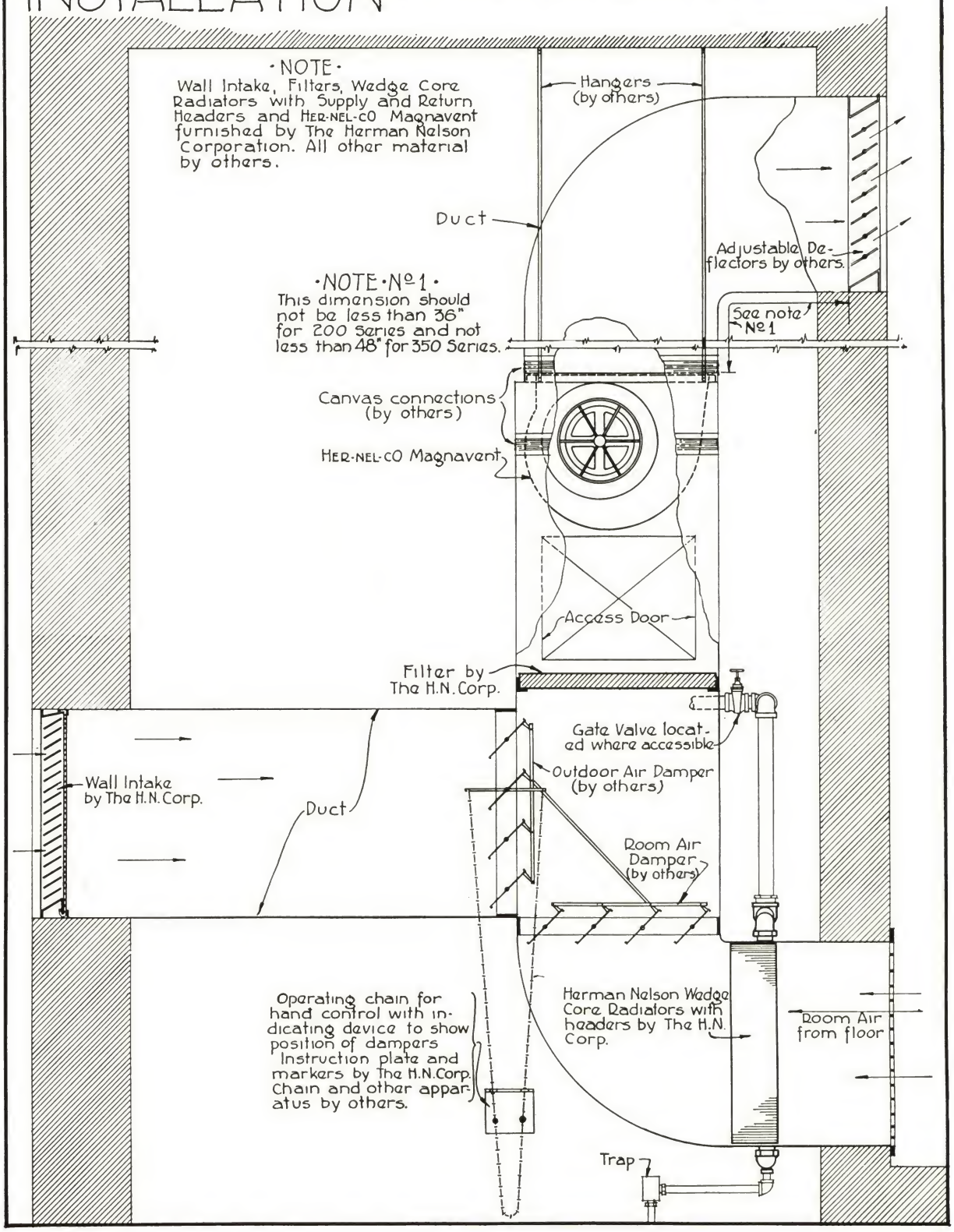
Full details will be gladly furnished to those who are interested.



·TYPICAL·AUDITORIUM·INSTALLATION·
OF
THE HERMAN NELSON SYSTEM OF VENTILATION
USING A DUCT DISTRIBUTING SYSTEM

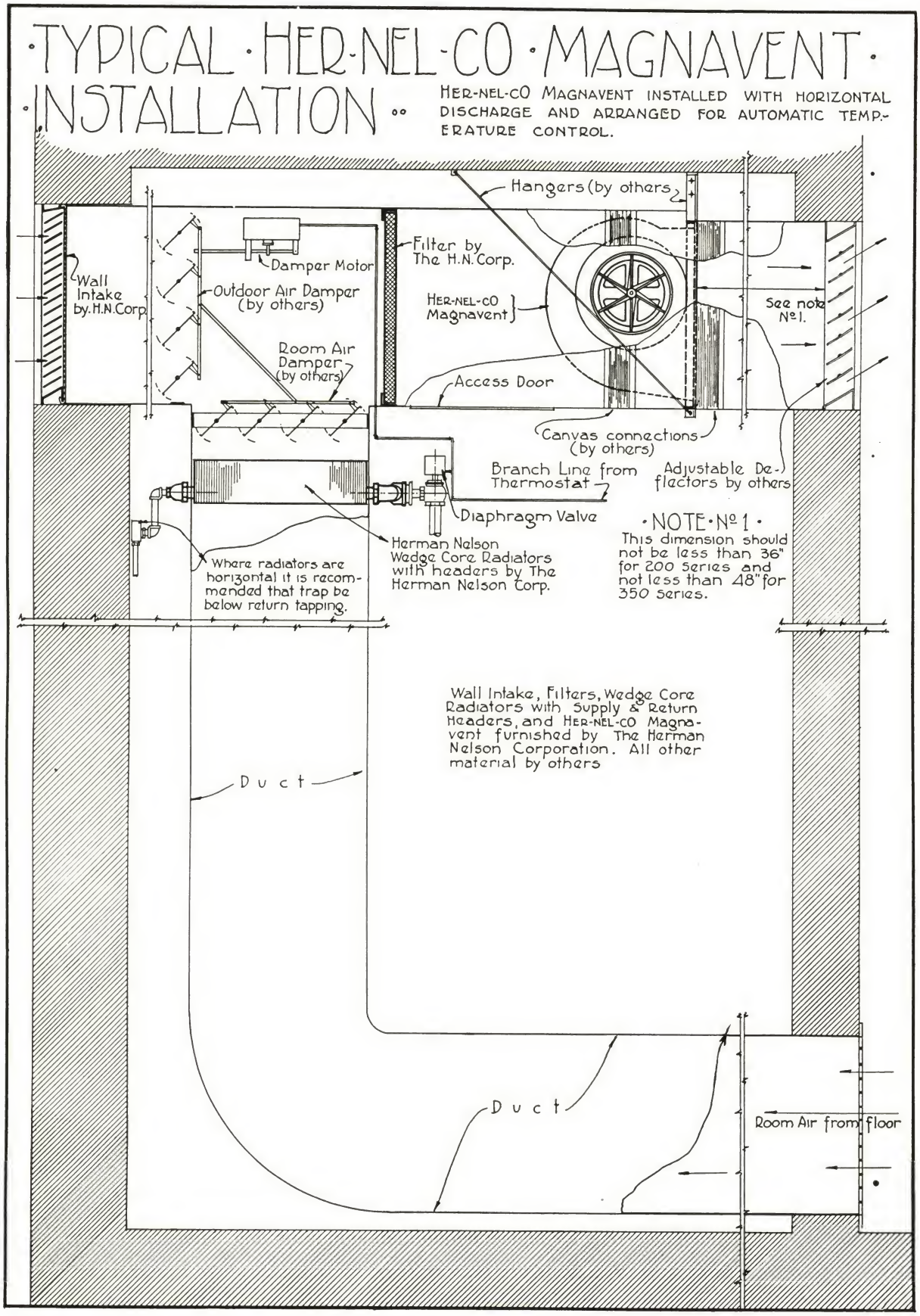
TYPICAL HER-NEL-CO MAGNAVENT INSTALLATION

HER-NEL-CO MAGNAVENT INSTALLED WITH VERTICAL DISCHARGE AND ARRANGED FOR HAND CONTROL.



TYPICAL HER-NEL-CO MAGNAVENT INSTALLATION

HER-NEL-CO MAGNAVENT INSTALLED WITH HORIZONTAL DISCHARGE AND ARRANGED FOR AUTOMATIC TEMPERATURE CONTROL.



Wiring Data

Her-Nel-Co Magnavent motors are of the adjustable speed type, with speed control obtained by means of Her-Nel-Co Speed Controllers. For this reason, the wiring arrangements are different than those for standard motors.

All single-phase Her-Nel-Co Magnavent motors have high efficiency and power factor and low starting current, and are very quiet over the entire range of speeds. All three-phase Her-Nel-Co Magnavent motors are also specially designed to have the same characteristics.

All single-phase and direct current motors have only two leads, while the three-phase motors have three.

As shown below, each alternating current motor or group of motors, should be preceded by a Her-Nel-Co Speed Controller. In the same way, each direct current motor or group of motors should be controlled by a rheostat. Where a group of motors are controlled by a rheostat, or Her-Nel-Co Speed Controller (illustrated on page 32), each motor should be provided with a separate switch and fuses, as shown. In addition, each rheostat or controller should be preceded by a switch and fuses, as shown.

Due to the low starting current and high power factor, single-phase Her-Nel-Co Magnavent motors may be used on the separate phase of a three-phase service, as shown. A separate controller should be used for each phase.

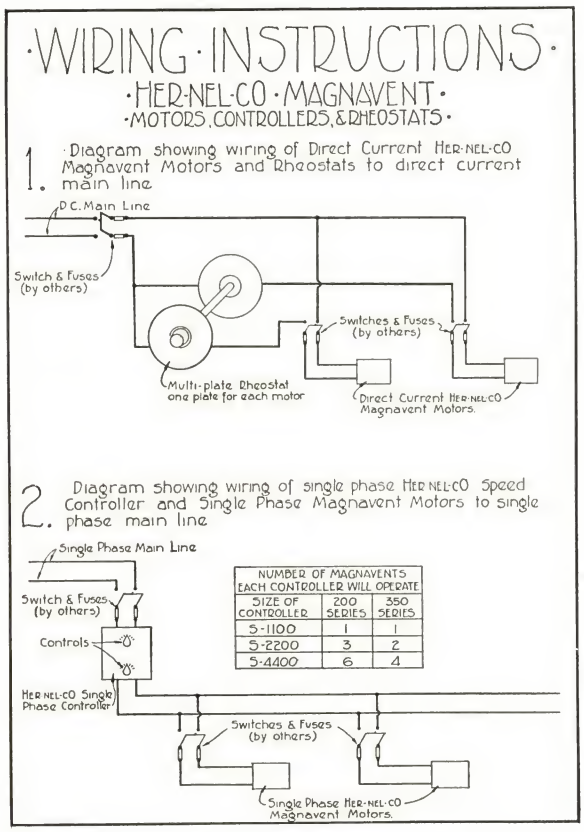
All Her-Nel-Co Speed Controllers are mounted in substantial steel cases, and have two adjustment knobs, both of which are provided with limit stops and indicators.

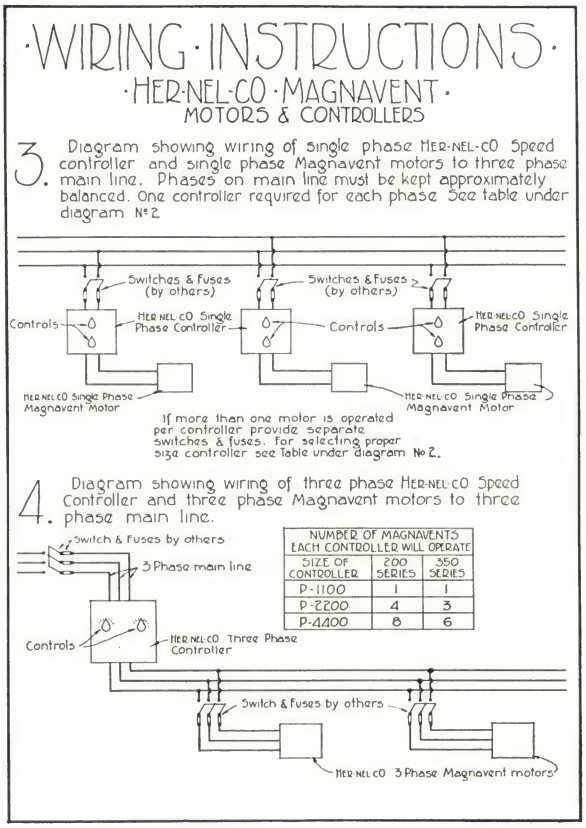
No switches or fuses are provided with Her-Nel-Co motors or Speed Controllers.

All wires should be sized to limit the voltage drop at the last motor to three (3) volts.

Type of current	Number of phases	Frequency	Voltage	Code word	Approx. amperes per leads 200 Series	Approx. amperes per leads 350 Series
Alternating	1 phase	25	110	Macar	6.0	8.4
			220	Macho	3.0	4.2
		50	110	Maleo	5.0	7.0
			220	Malic	2.5	3.5
		60	110	Malva	6.0	8.4
			220	Mango	3.0	4.2
	3 phase	50	220	Meros	1.75	1.8
			440	Molar	.65	.9
		60	220	Monal	1.5	2.1
			440	Moody	.75	1.1
Direct			110-125	Moray	4.8	7.0
			220-250	Mosey	2.4	3.5

Note: The above data will be useful in determining wire sizes, etc.





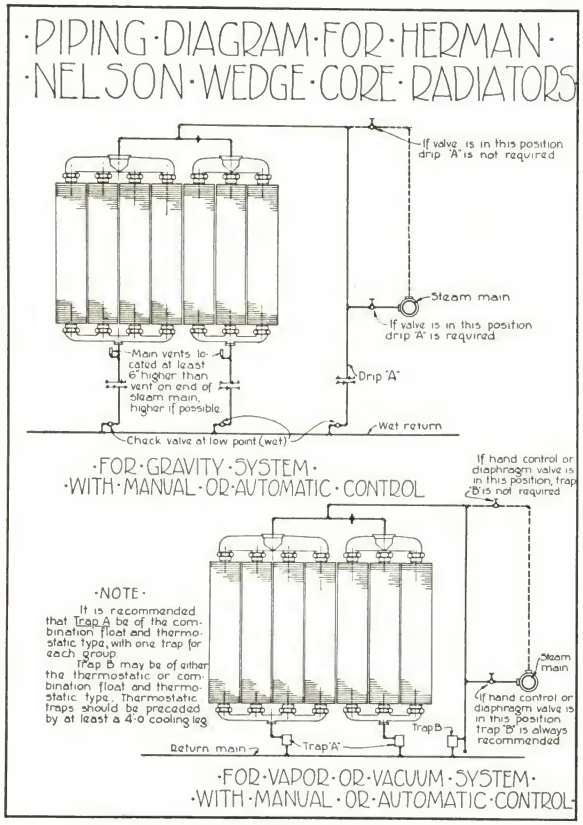
Piping Suggestions

The Herman Nelson Wedge Core Radiators used with Her-Nel-Co Magnavents should be piped as an ordinary radiator having the same heating capacity.

Headers

The Herman Nelson Wedge Core Radiators are shipped in groups as shown on page 34, with supply and return headers in place.

When ordered for use on vapor or vacuum or gravity steam systems, the headers are shipped as shown. When ordered for use on a forced circulation hot water system, both headers are the same as the supply header. When used for hot water and the sections are installed in a vertical position, an air vent should be provided above the upper header. When the sections are horizontal, this information should be given in order that individual vents may be provided in the sections.



Vapor and Vacuum Systems

For vapor and vacuum systems, combination float and thermostatic traps are always recommended. A separate trap should be provided for each group.

Gravity Systems

When connected to a gravity system the Herman Nelson Radiators should have two pipe connections even though all other radiators on the job have one pipe connection. Care should be taken to provide a tight check valve in each return connection located at the lowest possible point.

Hot Water Systems

Where hot water systems are used with the Her-Nel-Co Ventilator forced circulation should be employed as gravity systems are not recommended.

Supply Valves

Hand Control—When the Magnavent is controlled by hand, the supply valve on the Herman Nelson Radiators is either fully open or fully closed. For this reason, a gate valve should be used for all types of hand controlled systems.

Automatic Temperature Control—When automatic temperature control is used, the steam supply is throttled in the same way as with the Her-Nel-Co Ventilator. For this reason the regular diaphragm valve should be used.

Location of Supply Valves for Vapor, Vacuum or Gravity Systems

The location of the supply valve is very important for either hand or automatic temperature control. When the valve is at the same level or above the supply tapping and the piping is so arranged that water cannot stand in the piping between the valve and the radiators, no special precautions are necessary.

On the other hand, when the supply valve is below the supply tapping, the riser between the valve and the radiators should be drained in order to prevent water from accumulating at this point, as shown at the left.

All piping, valves and traps should be sized on the basis of the heating capacities given on page 32 for the Magnavent selected.

THE HERMAN NELSON UNIVENT

The Herman Nelson Univent is a unit ventilator arranged to introduce, in a positive way, a fixed amount of outdoor air at all times. It takes air directly from out-of-doors, cleans it, warms it to a comfortable degree and distributes it throughout the room with gentle air motion but without drafts. It makes the amount of air admitted, the motion of the air and the temperature of the room all easy to control.

General Construction

The Univent, as shown on this and the following page, consists of a substantial steel cabinet, a fan and motor assembly, filter, and a pair of Herman Nelson Wedge Core Radiators.

Operation

The air is drawn into the fan and forced upward through the filter where it is cleaned. Then, when heating is required, the air passes upward through the Herman Nelson Radiator where it is warmed. If the air does not require heating, it passes through the by-pass in back of the radiator.

The air is then discharged vertically upward at high velocity, thus thoroughly diffusing the air throughout the room. The amount of heat added to the air is determined by the position of the mixing damper.

Application

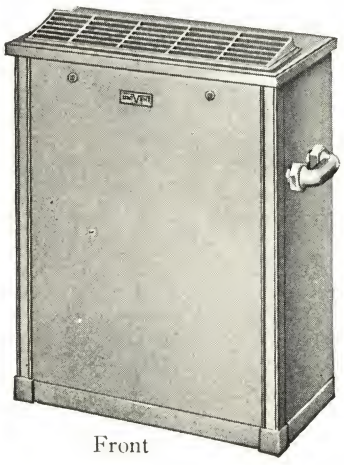
Rooms in which odors or fumes occur, or, which have excessive humidity, such as chemical and cooking laboratories, cafeterias, locker rooms, toilet rooms, swimming pools, etc., should be ventilated in such a manner that they are made livable, and so that adjoining rooms are not contaminated. Experience has shown that this result can be best accomplished by mechanically exhausting a fixed amount of air from the room. Experience has also shown that whenever the amount of air exhausted by mechanical means exceeds two room volumes per hour, means should be provided to replace practically all of the exhausted air with clean air at the proper temperature in a positive manner.

When such means are not provided the leakage around the windows, doors, etc., is greatly increased, causing drafts, and bringing in a great deal of dirt. No fuel is saved by depending upon leakage because whether the air is introduced positively or comes in through leakage, the same amount of air has to be heated through the same temperature range, requiring the same amount of fuel. A logical way to replace the exhausted air is by means of the Herman Nelson Univent. Toilet rooms, etc., are exceptions to these recommendations.

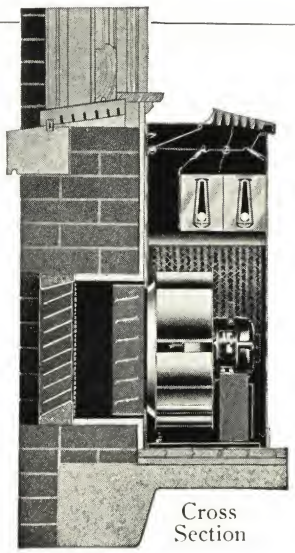
Then, too, in very special cases, where body odors may be present to an abnormal extent, it may be desired to introduce the full volume of outdoor air at all times. In such cases the Univent system is an ideal means of accomplishing this result.

However, it should be carefully noticed that a system of this kind which introduces the full amount of outdoor air at all times must heat this air from the outdoor to the room temperature. Heating all of the air through this temperature range requires a large amount of heat, with a result that the first cost is materially greater than the Her-Nel-Co System because the boilers, piping, chimney, etc., are larger. The fuel consumption is also much greater.

In short the full amount of outdoor air may be introduced at all times, providing the owners are willing to pay the additional first cost and for the additional fuel required.



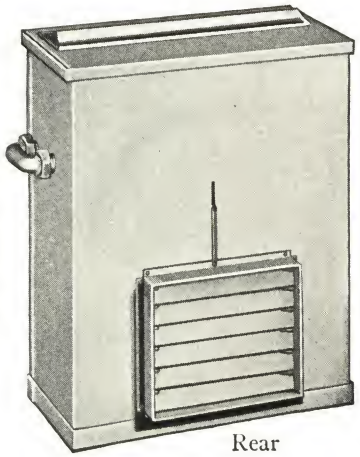
Front



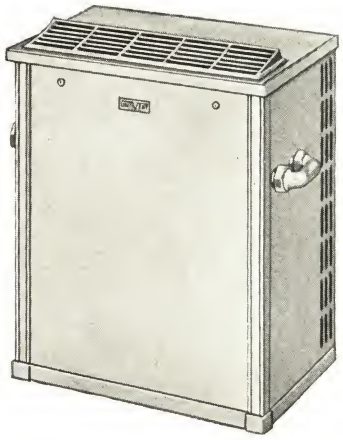
Cross Section

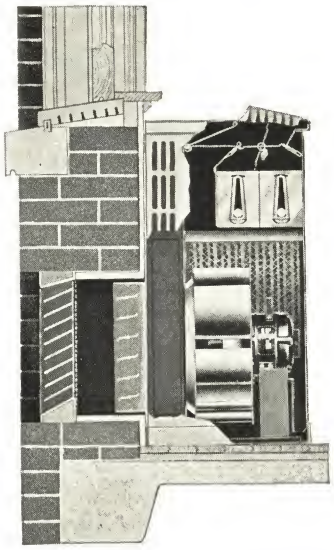
Model "SD" Univent

Designed for use where no provision for recirculating the air within the room is required. It is equipped with movable dampers at the outdoor air intake, which may be operated by hand or automatically



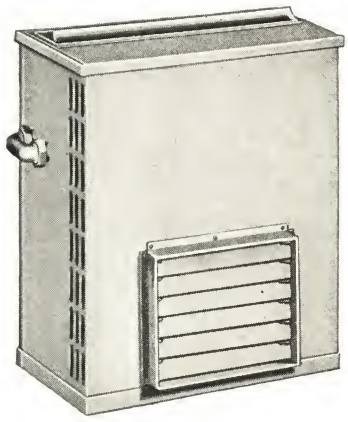
Rear

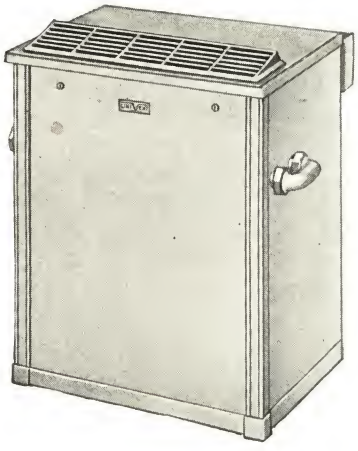




Model "R" Univent

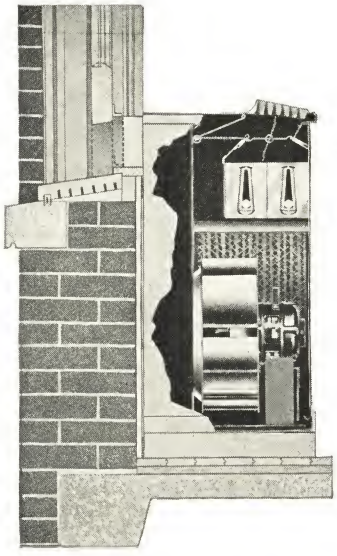
Equipped with combination outdoor air intake and recirculating dampers for use where it is desired, at times, to recirculate the air within the room. Dampers are arranged for either manual or automatic control.

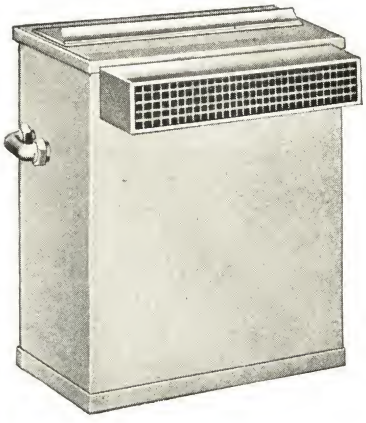


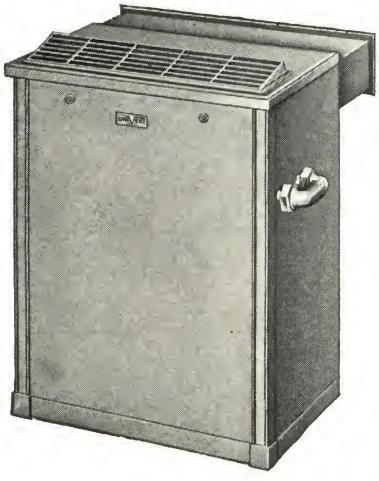


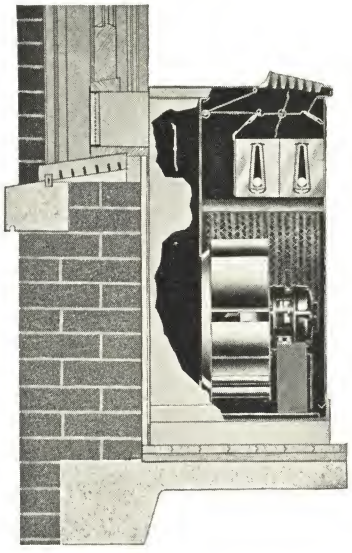
Model "O" Univent

Designed for use where it is more practical to draw outdoor air through the lower part of the window. Can be more conveniently installed in existing buildings where it is impractical to cut openings through the wall. When outside air supply is required, lower window sash is raised. No dampers required for this control.



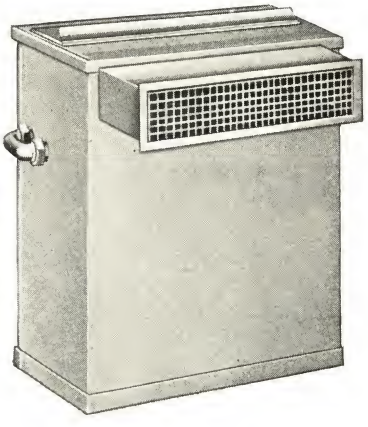






Model "W" Univent

Essentially the same as Model "O" except that it is arranged for *permanent* connection to lower window sash, and for this reason is better adapted for schoolrooms where it may not be advisable to leave control of air supply to room occupants. No provision is made for recirculating air in room. If recirculation is desirable select Model "WR" which is identical to Model "W" except for the recirculating feature as shown in Model "R."



Features of the Univent

Cabinet

The Univent cabinet is fabricated from high grade furniture steel and is finished in genuine "Morocco" enamel with plated hardware. It is arranged to be fastened against the wall with a gasket which prevents any air leakage. The entire front is removable giving free access to all parts.

Motor and Fan Unit

In the lower compartment of the Univent there is a small electric motor which operates a slow-speed fan. The Univent Her-Nel-Co motor is carefully designed and proportioned for the specific service to which it is applied and is extremely quiet in operation. The motor may be had for all the more and usual current characteristics.

The fan is specially designed to deliver the required quantity of air at a sufficiently high velocity to assure good diffusion. It is so built that it prevents cross currents and eddies in the air stream, thereby reducing power costs.

Filter

Every Univent provides for the insertion above the fan and motor unit of a filter which, while not supplied as standard, can be furnished at comparatively small additional cost. Air passing through this filter, specially built for use in the Univent loses 95 to 98 per cent of its dust and soot content.

Heating Element

The heating element in the Univent consists of two Herman Nelson Wedge Core Radiator Sections (see pages 2 and 3). The radiator is built entirely of aluminum which, because of its light weight and high conductivity, will transmit about twice as much heat per unit of weight as either copper or silver, six times as much as brass and twelve times as much as cast iron. Unfailing service is assured with this radiator because it is impervious to rust, expansion, contraction and water hammer strains.

Humidifier

The Univent can be fitted with a humidifier consisting of a tube fitted its entire length with a row of small venturi nozzles.

Temperature Control

Temperature control is accomplished by means of dampers located immediately above the radiators. All Univent mixing dampers are mounted on rust-proof ball bearings and operate against felt cushions to insure smooth and quiet operation.

These dampers may be operated either manually, with a knob at the end of the cabinet, or automatically, by any of the well-known systems of automatic control.

Automatic temperature control is always desirable, for it eliminates the necessity for attention by the teacher.

Any of the systems on the market can be very easily applied to the Univent. Temperature control may be applied to the radiator itself as well as to the dampers. This is recommended because it reduces the tendency to overheat.

Pipe Connections

Univents are normally furnished with the supply and return connections at the right end as you face the cabinet, with the supply connection in front. If so ordered, they may be furnished with supply and return on the left end or on opposite ends.

Air Intakes

Each Univent is regularly furnished with an air intake. The intakes are sold as part of the Univent, and are usually furnished in advance for insertion in the wall during the building construction. They are built of wrought steel, cadmium plated after fabrication and finished with two coats of standard brown lacquer.

When some other color is desired to blend with the building exterior, they may be painted on the job over the lacquer.

We make no secret of the fact that other ventilating systems are, as a rule, priced lower than the Univent. Rather, we prefer to emphasize this fact—then ask this question: "Why is it, that despite its seemingly higher cost, school boards, architects and engineers have chosen to install Univent Ventilation in thousands of America's schools?"

The answer is simple. They have selected the Univent because of factors which first cost does not show. They have selected it, first, because they know it will accomplish definite results—the results which they are seeking. Second, because its own higher first cost is many times more than offset by the savings that it effects in building construction. And, third, because of its low cost of operation and maintenance.

When we consider the fact that truly effective ventilation promotes the daily comfort, mental efficiency and physical fitness of every child in the schoolroom—and when we further consider that good ventilation cannot possibly be attained by haphazard methods—we realize the folly of compromise on the subject of schoolroom ventilation.

School executives, architects and engineers have found liberal and emphatic proof that the results of Univent Ventilation cannot be bettered—frequently not equalled—by substituting other equipment. One of the many reasons is—that many important Univent features are patented and exclusive to the Univent as manufactured by THE HERMAN NELSON CORPORATION.

How to Apply the Univent

The Univent is a compact ventilating unit, scientifically designed and constructed to accomplish a definite ventilating result. As with any other mechanical equipment, the measure in which this result is obtained depends to a great extent upon the manner of the application. To secure the best possible ventilating results the architect or engineer should always insist upon the proper application of the Univent, for improper application will defeat its purpose. When properly applied, Univent Ventilation will accomplish all that is claimed for it, as thousands of installations in the United States and foreign countries have conclusively demonstrated.

Univent Principles

There are four (4) fundamental principles that should always be carefully considered by the engineer in the application of the Univent system.

First—Each room or space should be provided with its own ventilating system, independent of the systems in all other rooms or spaces. The use of a Univent for each room or space provides properly controlled ventilation in keeping with the requirements of each individual room. Using ducts on the outlet of the Univent to ventilate two or more spaces obviously defeats this principle of Univent Ventilation by substituting group room control for unit room control.

Second—All inaccessible and uncleanable ducts, flues, chambers, etc., should be avoided. When the Univent is properly applied the entire path of air from outdoors through the Univent and into the room is easily and quickly accessible for cleaning. Concealing or fully recessing the Univent or the addition of inlet and outlet ducts for other than standard application are all discouraged because they invariably result in uncleanable and, therefore, unsanitary spaces. Partially recessing the Univent to save aisle space may be accomplished, as shown on pages 52 to 61, without interfering with the accessibility or cleanliness of the system.

Third—The air for ventilation should be thoroughly diffused throughout the room or occupied space with agreeable air motion but without *drafts*. The comparatively high velocity vertical jet employed in the Univent is largely responsible for the satisfactory Univent results. Anything that interferes with this jet, such as outlet ducts, etc., will defeat this principle of Univent Ventilation. In order to obtain the full benefit from the high velocity vertical jet, the Univent should be located as near as possible to the center of the most exposed wall. If this wall is longer than 35 ft., two or more Univents are required and should be spaced uniformly along the wall. Experience has demonstrated that the rate at which the air is changed in the room greatly influences the diffusion. For thorough diffusion the Univent should change the air of the room from six to ten times per hour depending upon individual room requirements.

Fourth—The operation of the ventilating system should be obvious to the most casual observer. For this reason, the Univent should be located where it will be exposed to view. "Seeing is believing"—teachers or other occupants should be able to observe the process of ventilation.

Venting

It is true that all the air forced into the room by the Univent must leave the room in some way or other. However, contrary to common conception, it is not necessary to provide large openings or apertures to serve the purpose. Because of this prevailing erroneous assumption, many laws and ordinances require the provision of large vent openings. However, experience has demonstrated that far better ventilating results are obtained when the vent outlets are restricted in such a manner that a slight pressure is built up in the room. This slight pressure is very effective in counteracting infiltration or inward leakage of cold air and, in addition, improves the diffusion of the air in the room. We, therefore, recommend that the vent opening, regardless of its arrangement, be restricted to a maximum of 18 sq. in. for each 100 cu. ft. per minute of Univent air capacity. This area should not be exceeded in the free opening of the grille or in the vent flue, if one is used. In addition, provision should be made for tightly closing the individual room vents or the roof ventilators. However, local laws or codes may govern the procedure.

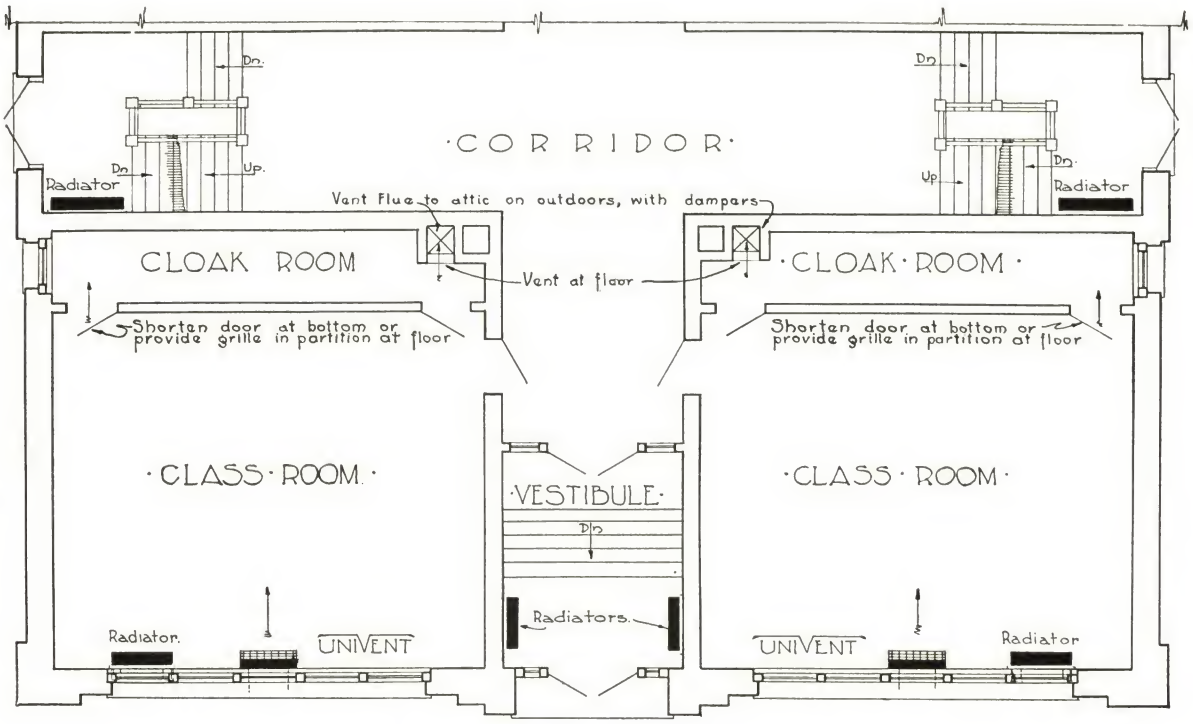
Vent Flues—One method of venting is by means of vent flues which connect each room to the attic or directly to the outdoors, as shown on diagram on page 46. This method involves considerable construction and building cost but is sometimes required by local laws.

Corridor Venting—A number of years ago this company suggested "Corridor Venting" in which the air from the room escapes into the corridor through a small grille at the base of the door or in the wall near the floor, as shown in diagram, page 46. This method was found just as satisfactory from a ventilation standpoint as individual vent flues, and, in addition, reduced building cost by decreasing the size and cost of the building itself. This suggestion, made ten years ago by this company, has since met with favor and has been acted upon by many well-known authorities. In several cases, code requirements have been changed to permit "Corridor Venting."

Summation of Procedures

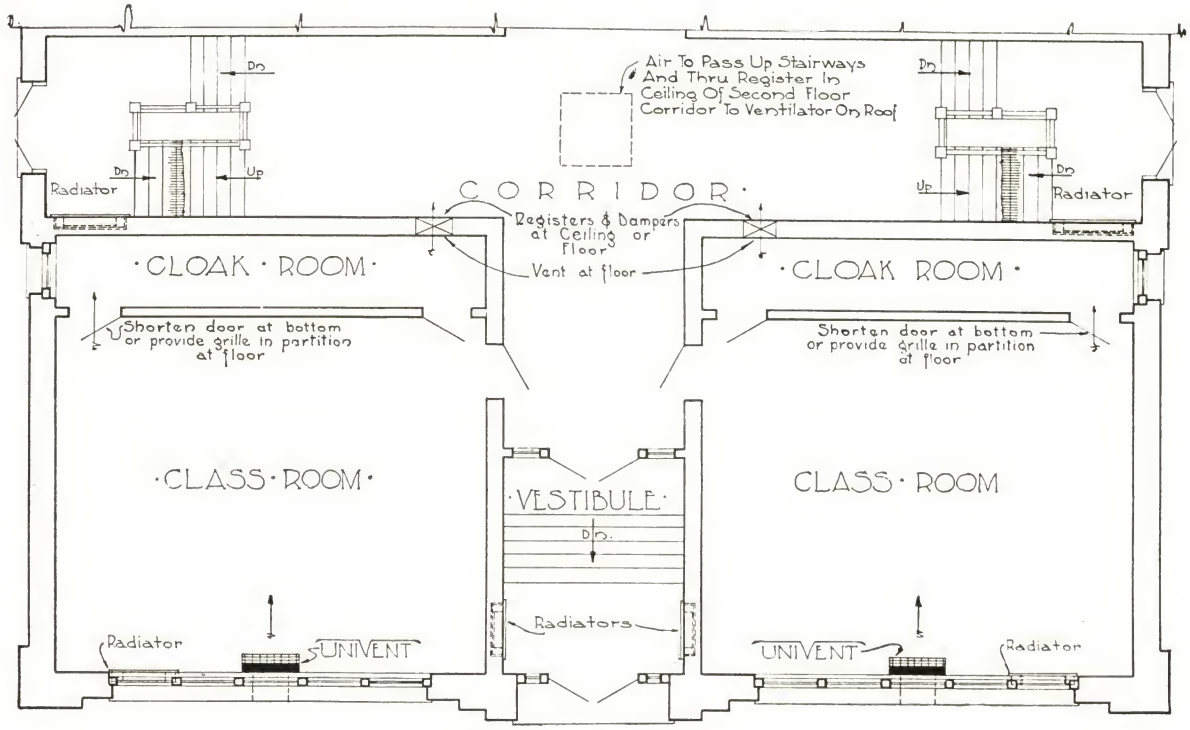
The following procedures are therefore recommended for the proper application of the Univent:

1. Use one or more Univents for each room to be ventilated.
2. Install all Univents in such a manner that they may be easily and quickly inspected and cleaned. Partial recessing may be accomplished without jeopardizing the cleanliness of the system, but do not conceal or fully recess Univents.
3. Do not add duct extensions to the Univent outlets because they destroy the high velocity jet principle of diffusion.
4. Locate the Univent in the center of the most exposed wall. If this wall is longer than thirty-five feet, use two or more Univents.
5. Univents should have sufficient capacity to change the air in the room from six to ten times per hour.
6. The Univent should be exposed to view to make the ventilating process obvious to the most casual observer.
7. Provide vent outlets having a maximum area of 18 sq. in. per 100 cu. ft. and equipped with tight shut-off dampers.



Typical Univent Installation Employing Vent Flues

Exposed radiators have been used



Typical Univent Installation Employing Corridor Venting

Herman Nelson Invisible Radiators have been used

How to Select the Proper Univent

The results obtained from any system of ventilation will depend as much upon the competency of the engineer as upon the system or character of equipment selected. While both are extremely important, it is recommended that the services of a competent, experienced engineer be employed to insure the proper selection and application of equipment and design of the system, as a whole, to meet the requirements of the particular building to be ventilated.

Air Delivery

The amount of air to be circulated for ventilation in classrooms is frequently stipulated in the local ventilation ordinances —30 c.f.m. per pupil is one of the most usual requirements. To obtain proper diffusion, Univents should be selected to change the air in the rooms at a rate of from six to ten times per hour, depending upon individual room requirements and whether a *"split," "modified"* or *"blast"* system is employed.

In a *"split"* system, the Univent is used for ventilating only, and heats the incoming air to approximately room temperature. Direct radiators are used for heating. In a *"blast"* system, all of the heating is done by the Univent. In the *"modified"* system, which was introduced by this company some years ago, half of the heating load is taken care of by the Univent while the remainder is supplied by direct radiation.

By referring to pages 48 to 51, it will be found that the Univent is made in four (4) lengths, from 25 to 55 in., and that each length is equipped with three radiator sizes. For each radiator size, three air deliveries are given. The low deliveries give comparatively low outlet velocities and are recommended for low ceiling heights (10 ft. or less). Likewise, the medium velocity units are for medium ceiling heights (10 to 12 ft.) and the high velocity units for high ceilings (12 ft. and over). The performance for any other air delivery within the range of the tables may be determined by interpolation.

Heating Capacity

After the required air delivery has been determined, the next step is to determine the amount of heating capacity required in the Univent. This is purely a matter of engineering and involves the calculation of the heat losses of the room. From the total heat losses, the heat output from direct radiators to be installed in the room should be subtracted. The difference is the additional heating capacity required and the Univent should be selected with a radiator giving this heating capacity. (See bold face figures in capacity tables.)

The total capacity (light figures) represents the total load the Univent places on the boiler for both the heating and ventilating duty and should be used in determining the size of boiler, piping, etc.

Univent Models

Each size of Univent is built in five (5) models depending upon the method of admitting the air to the fan, as shown on pages 52 to 61. Thus, 180 combinations are offered to enable the engineer to select the Univent to meet most any condition found in practice.

Selecting the Model

The following example will serve to illustrate the method of selecting Univents:

Room to Be Ventilated—Assume a standard size classroom, 30 ft. long, 24 ft. wide, with a ceiling height of 12 ft. and a seating capacity of 40 pupils.

Assume that the Model "SD" Univent is to be used.

Assume that the heat losses have been calculated in the regular way and found to be 160 sq. ft. of direct radiation for a room temperature of 70° F., a minimum outdoor temperature of minus 10° F. and including an allowance for quick heating.

Air Delivery of the Univent—Allowing 30 c.f.m. per pupil, 1200 c.f.m. is required. On this basis a high outlet velocity 4500 series Univent having a capacity of 1260 c.f.m. is the logical selection. If the ceiling height were 10 ft. or lower, a low outlet velocity 5500 series Univent having a capacity of 1210 c.f.m. would be used.

Assume tentatively that a high outlet velocity 4500 series Univent is selected. The rate of air change for 1260 c.f.m. is found as follows:

Room content $= 30 \times 24 \times 12 = 8640$ *cu. ft.*

Air delivery $= 1260 \times 60 = 75{,}600$ *cu. ft. per hour.*

$$\textit{Rate of air change} = \frac{75{,}600}{8640} = 8.75 \textit{ changes per hour.}$$

This should be a satisfactory selection for a *"splti"* or *"modified"* system but for a *"blast"* system a greater number of air changes are recommended.

For the *"blast"* system a high outlet velocity 5500 series Univent should be used, for which the rate of air change is found as follows:

Air delivery $= 1540 \times 60 = 92{,}400.$

$$\textit{Rate of air change} = \frac{92{,}400}{8640} = 10.7 \textit{ changes per hour.}$$

This is a satisfactory rate of air change for the *"blast"* system.

Therefore, the proper selections are a high outlet velocity 4500 series Univent for a *"split"* or *"modified"* system, and a high outlet velocity, large air delivery, 5500 series Univent for a *"blast"* system.

Heating Capacity of the Univent—After the air delivery has been determined the next step is to select the Univent having the proper heating capacity, depending upon the design of the system.

"Split" System—With a *"split"* system the Univent does not carry any of the heating load. Therefore, the proper selection is a Number 4531 "SD" Univent, having a final air temperature of 73° F. and an additional heating capacity of 15 sq. ft. In addition, at least 145 sq. ft. of radiation should be installed to take care of the heat losses.

"Modified" System—With a *"modified"* system the Univent takes care of approximately one-half the heating load. Therefore, a Number 4532 "SD" Univent, having a final air temperature of 85° F., and a heating capacity of 82 sq. ft. should be selected. In addition, at least 80 sq. ft. of radiation should be installed to take care of the balance of the heat losses.

"Blast" System—With a *"blast"* system the Univent supplies all the heat required. Therefore, the proper selection is a Number 5533 "SD" Univent, having a final air temperature of 96° F. and a heating capacity of 182 sq. ft. of direct radiation. No additional radiation is required unless the heat losses are greater than the Univent heating capacity.

MODELS SD–R

CAPACITY TABLES

FOR ENTERING AIR TEMPERATURES BELOW 0° F.

Serial No.	Code Word	Cu. ft. of air per min.	Total Capacities, Heating Capacities and Final Temperatures at various entering air temperatures.																		Increment
			−30°			−25°			−20°			−15°			−10°			−5°			
			Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	
2500 SERIES																					
2511	Uhlan	550	252	**4**	72	246	**10**	74	240	**17**	77	234	**23**	79	228	**29**	82	221	**36**	84	.501
2512	Ulmus	550	286	**38**	85	278	**44**	88	272	**50**	90	265	**55**	92	258	**60**	94	251	**65**	97	.446
2513	Ulnar	550	319	**72**	99	312	**77**	101	304	**82**	103	296	**86**	105	289	**91**	107	282	**96**	109	.391
2521	Ultra	625	276	**–**	68	269	**2**	71	262	**9**	73	256	**16**	76	248	**24**	78	242	**31**	81	.520
2522	Umber	625	311	**29**	80	304	**36**	83	296	**42**	85	289	**50**	88	281	**56**	90	275	**62**	92	.467
2523	Unarm	625	346	**65**	93	338	**71**	95	330	**76**	97	322	**82**	99	314	**89**	102	305	**94**	103	.414
2531	Unapt	700	285	**–**	61	280	**–**	64	274	**–**	67	268	**0**	70	261	**8**	73	253	**16**	75	.553
2532	Unbag	700	328	**13**	74	321	**22**	77	314	**30**	80	306	**38**	82	298	**46**	85	290	**53**	87	.493
2533	Unbid	700	372	**56**	88	362	**63**	90	353	**69**	92	344	**76**	94	335	**83**	96	326	**90**	99	.434
3500 SERIES																					
3511	Uncap	770	352	**6**	72	344	**14**	74	336	**24**	77	327	**32**	79	318	**41**	82	310	**50**	84	.501
3512	Uncia	770	400	**53**	85	390	**61**	88	381	**69**	90	371	**77**	92	362	**85**	94	352	**92**	97	.446
3513	Uncus	770	447	**101**	99	437	**108**	101	427	**115**	103	415	**121**	105	405	**128**	107	394	**135**	109	.391
3521	Under	875	384	**–**	68	374	**2**	71	367	**13**	73	358	**23**	76	348	**33**	78	338	**43**	81	.520
3522	Undue	875	434	**40**	80	424	**51**	83	414	**59**	85	404	**69**	88	394	**79**	90	382	**87**	92	.467
3523	Unfix	875	484	**91**	93	473	**99**	95	461	**107**	97	450	**115**	99	440	**124**	102	427	**131**	103	.414
3531	Unhap	980	395	**–**	61	388	**–**	64	380	**–**	67	371	**0**	70	361	**12**	73	350	**23**	75	.553
3532	Uniat	980	455	**18**	74	445	**31**	77	434	**44**	80	423	**53**	82	413	**63**	85	402	**74**	87	.493
3533	Unify	980	514	**78**	88	501	**87**	90	489	**96**	92	477	**106**	94	463	**115**	96	452	**125**	99	.434
4500 SERIES																					
4511	Union	990	453	**8**	72	443	**19**	74	432	**30**	77	420	**42**	79	410	**53**	82	398	**64**	84	.501
4512	Unity	990	515	**68**	85	502	**78**	88	490	**89**	90	477	**99**	92	465	**109**	94	453	**119**	97	.446
4513	Unlaw	990	575	**129**	99	562	**138**	101	549	**148**	103	534	**155**	105	522	**165**	107	507	**173**	109	.391
4521	Unman	1125	495	**–**	68	485	**3**	71	473	**16**	73	461	**29**	76	448	**43**	78	436	**55**	81	.520
4522	Unpin	1125	559	**52**	80	547	**65**	83	532	**76**	85	520	**89**	88	507	**101**	90	495	**112**	92	.467
4523	Unpeg	1125	623	**116**	93	609	**127**	95	594	**138**	97	580	**148**	99	565	**159**	102	550	**169**	103	.414
4531	Unoil	1260	517	**–**	61	508	**–**	64	497	**–**	67	486	**0**	70	473	**15**	73	458	**30**	75	.553
4532	Unrig	1260	591	**24**	74	578	**40**	77	564	**54**	80	550	**69**	82	536	**82**	85	522	**96**	87	.493
4533	Untie	1260	668	**101**	88	652	**113**	90	635	**125**	92	619	**137**	94	603	**149**	96	588	**162**	99	.434
5500 SERIES																					
5511	Upper	1210	553	**9**	72	540	**23**	74	527	**37**	77	513	**51**	79	500	**65**	82	487	**78**	84	.501
5512	Upset	1210	630	**84**	85	613	**96**	88	600	**109**	90	584	**120**	92	570	**133**	94	553	**145**	97	.446
5513	Urban	1210	704	**159**	99	687	**169**	101	670	**180**	103	653	**190**	105	637	**201**	107	620	**211**	109	.391
5521	Usage	1375	605	**–**	68	592	**4**	71	578	**20**	73	562	**36**	76	547	**52**	78	533	**68**	81	.520
5522	Usher	1375	682	**64**	80	668	**80**	83	650	**93**	85	635	**109**	88	620	**123**	90	602	**137**	92	.467
5523	Usual	1375	762	**142**	93	743	**156**	95	725	**169**	97	708	**181**	99	690	**195**	102	672	**206**	103	.414
5531	Usurp	1540	627	**–**	61	615	**–**	64	602	**–**	67	589	**0**	70	573	**19**	73	557	**37**	75	.553
5532	Utile	1540	720	**29**	74	705	**48**	77	689	**69**	80	673	**84**	82	655	**101**	85	637	**118**	87	.493
5533	Utter	1540	815	**123**	88	795	**138**	90	775	**152**	92	757	**168**	94	736	**182**	96	717	**198**	99	.434

All rated capacities are based on a steam temperature in the radiators of 218° F. and on an air delivery determined by the A. S. H. & V. E. standard anemometer method over the net area of the discharge outlet.

For each series there are three rated air deliveries with outlet velocities ranging from 800 to 1000 f.p.m.

The total capacity (equivalent square feet of direct radiation) shown in light figures, should be used to determine boiler, piping, trap and valve sizes.

Bold face figures indicate the additional heating capacity (equivalent square feet of direct radiation) available for warming the room to 70° F. after ventilation requirements have been taken care of.

MODELS SD–R

CAPACITY TABLES

FOR ENTERING AIR TEMPERATURES 0° F. AND ABOVE

Serial No.	Code Word	Cu. ft. of air per min.	Total Capacities, Heating Capacities and Final Temperatures at various entering air temperatures.																		Increment
			0°			+10°			+20°			+30°			+40°			+70°			
			Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	
2500 SERIES																					
2511	Uhlan	550	215	**42**	87	202	**54**	92	190	**66**	97	178	**79**	102	166	**92**	107	128	**128**	122	.501
2512	Ulmus	550	245	**72**	99	230	**82**	103	217	**94**	108	200	**104**	111	186	**111**	115	149	**149**	130	.446
2513	Ulnar	550	274	**101**	111	259	**111**	115	244	**120**	119	224	**125**	121	210	**136**	125	169	**169**	138	.391
2521	Ultra	625	235	**38**	84	220	**51**	88	207	**67**	94	194	**81**	99	180	**96**	104	140	**140**	120	.520
2522	Umber	625	266	**69**	95	250	**81**	99	235	**95**	104	220	**108**	108	205	**121**	113	160	**160**	127	.467
2523	Unarm	625	297	**99**	105	280	**111**	110	263	**123**	114	247	**135**	118	230	**146**	122	181	**181**	134	.414
2531	Unapt	700	246	**26**	78	232	**43**	84	218	**60**	89	203	**77**	94	186	**91**	99	145	**145**	116	.553
2532	Unbag	700	282	**61**	89	266	**77**	94	250	**92**	99	234	**107**	104	217	**123**	109	169	**169**	124	.493
2533	Unbid	700	317	**97**	101	300	**111**	105	282	**125**	110	264	**138**	114	246	**151**	118	193	**193**	131	.434
3500 SERIES																					
3511	Uncap	770	301	**58**	87	283	**75**	92	266	**93**	97	249	**110**	102	232	**128**	107	180	**180**	122	.501
3512	Uncia	770	343	**100**	99	323	**115**	103	304	**131**	108	281	**142**	111	260	**156**	115	208	**208**	130	.446
3513	Uncus	770	384	**142**	111	362	**155**	115	342	**169**	119	314	**175**	121	294	**190**	125	236	**236**	138	.391
3521	Under	875	329	**53**	84	308	**71**	88	290	**93**	94	271	**114**	99	252	**134**	104	195	**195**	120	.520
3522	Undue	875	372	**96**	95	350	**114**	99	329	**133**	104	309	**151**	108	288	**169**	113	225	**225**	127	.467
3523	Unfix	875	415	**139**	105	392	**156**	110	369	**172**	114	346	**188**	118	323	**205**	122	253	**253**	134	.414
3531	Unhap	980	341	**35**	78	322	**59**	84	301	**82**	89	281	**106**	94	260	**128**	99	200	**200**	116	.553
3532	Uniat	980	390	**85**	89	368	**106**	94	346	**127**	99	324	**149**	104	304	**172**	109	234	**234**	124	.493
3533	Unify	980	440	**131**	101	415	**153**	105	391	**172**	110	366	**192**	114	344	**212**	118	267	**267**	131	.434
4500 SERIES																					
4511	Union	990	387	**76**	87	364	**97**	92	342	**119**	97	320	**142**	102	298	**165**	107	231	**231**	122	.501
4512	Unity	990	441	**129**	99	415	**148**	103	387	**168**	108	361	**183**	111	334	**200**	115	268	**268**	130	.446
4513	Unlaw	990	494	**182**	111	467	**199**	115	440	**217**	119	403	**234**	121	379	**245**	125	304	**304**	138	.391
4521	Unman	1125	423	**68**	84	396	**94**	88	373	**120**	94	350	**146**	99	324	**172**	104	251	**251**	120	.520
4522	Unpin	1125	478	**124**	95	450	**146**	99	424	**171**	104	397	**194**	108	370	**218**	113	289	**289**	127	.467
4523	Unpeg	1125	535	**179**	105	505	**200**	110	475	**221**	114	445	**242**	118	415	**263**	122	326	**326**	134	.414
4531	Unoil	1260	446	**46**	78	421	**77**	84	394	**107**	89	363	**138**	94	334	**164**	99	262	**262**	116	.553
4532	Unrig	1260	507	**110**	89	478	**138**	94	448	**166**	99	420	**193**	104	391	**221**	109	304	**304**	124	.493
4533	Untie	1260	571	**174**	101	539	**199**	105	507	**224**	110	475	**248**	114	442	**272**	118	347	**347**	131	.434
5500 SERIES																					
5511	Upper	1210	473	**92**	87	445	**118**	92	418	**146**	97	392	**173**	102	365	**201**	107	283	**283**	122	.501
5512	Upset	1210	538	**157**	99	508	**181**	103	478	**206**	108	442	**224**	111	408	**245**	115	327	**327**	130	.446
5513	Urban	1210	603	**223**	111	570	**244**	115	538	**265**	119	493	**275**	121	463	**299**	125	372	**372**	138	.391
5521	Usage	1375	517	**84**	84	485	**113**	88	456	**147**	94	427	**179**	99	396	**211**	104	308	**308**	120	.520
5522	Usher	1375	585	**152**	95	550	**179**	99	518	**209**	104	486	**238**	108	452	**266**	113	353	**353**	127	.467
5523	Usual	1375	653	**219**	105	616	**245**	110	580	**271**	114	544	**297**	118	508	**322**	122	399	**399**	134	.414
5531	Usurp	1540	541	**55**	78	510	**94**	84	478	**131**	89	446	**168**	94	409	**201**	99	318	**318**	116	.553
5532	Utile	1540	619	**134**	89	585	**169**	94	548	**202**	99	513	**236**	104	478	**270**	109	371	**371**	124	.493
5533	Utter	1540	697	**213**	101	658	**243**	105	620	**274**	110	581	**304**	114	540	**333**	118	423	**423**	131	.434

The last column shows the increment to be added or deducted to the final temperature per degree change in entering air temperature.

If it be desired to find the final temperature of a given machine when the entering air temperature is —35°, subtract the increment multiplied by 5 from the final temperature shown in the —30° column.

If it be desired to find the final temperature when the entering air is +35°, add the increment multiplied by 5 to the final temperature shown in the +30° column.

Note that the increment is added for higher entering air temperatures and subtracted for lower entering air temperatures.

MODELS O—W—WR

CAPACITY TABLES

FOR ENTERING AIR TEMPERATURES BELOW 0° F.

Serial No.	Code Word	Cu. ft. of air per min.	Total Capacities, Heating Capacities and Final Temperatures at various entering air temperatures.																		Increment
			−30°			−25°			−20°			−15°			−10°			−5°			
			Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	
2500 SERIES																					
2511	Uhlan	500	238	**13**	76	233	**19**	79	227	**25**	81	221	**30**	83	215	**35**	86	209	**40**	88	.485
2512	Ulmus	500	270	**45**	90	264	**50**	92	258	**55**	95	251	**60**	96	244	**65**	99	238	**69**	101	.428
2513	Ulnar	500	302	**77**	104	295	**81**	106	287	**85**	108	280	**89**	110	274	**94**	112	266	**97**	113	.370
2521	Ultra	570	261	**4**	72	254	**11**	74	248	**17**	77	242	**23**	79	236	**30**	82	230	**37**	85	.501
2522	Umber	570	294	**38**	85	288	**44**	87	280	**49**	89	273	**55**	91	266	**61**	94	259	**67**	96	.447
2523	Unarm	570	328	**71**	98	320	**76**	100	312	**81**	102	304	**86**	104	296	**91**	106	288	**97**	108	.394
2531	Unapt	650	284	**–**	67	278	**0**	70	270	**7**	73	263	**15**	75	256	**22**	78	249	**30**	80	.520
2532	Unbag	650	320	**27**	79	312	**35**	82	304	**41**	84	296	**48**	86	289	**55**	89	281	**62**	91	.471
2533	Unbid	650	355	**63**	91	347	**69**	94	338	**75**	96	330	**81**	98	321	**87**	100	313	**94**	102	.421
3500 SERIES																					
3511	Uncap	700	334	**19**	76	326	**27**	79	319	**35**	81	310	**42**	83	302	**50**	86	293	**56**	88	.485
3512	Uncia	700	378	**63**	90	370	**70**	92	361	**77**	95	352	**83**	96	342	**90**	99	333	**96**	101	.428
3513	Uncus	700	422	**107**	104	413	**113**	106	403	**119**	108	392	**125**	110	383	**131**	112	374	**137**	113	.370
3521	Under	800	366	**6**	72	357	**15**	74	349	**24**	77	339	**33**	79	331	**43**	82	322	**52**	85	.501
3522	Undue	800	413	**53**	85	403	**61**	87	393	**69**	89	383	**77**	91	374	**86**	94	364	**94**	96	.447
3523	Unfix	800	460	**100**	98	448	**107**	100	438	**114**	102	427	**121**	104	416	**128**	106	405	**135**	108	.394
3531	Unhap	910	397	**–**	67	389	**0**	70	378	**10**	73	368	**21**	75	358	**32**	78	348	**41**	80	.520
3532	Uniat	910	448	**38**	79	437	**48**	82	427	**58**	84	416	**67**	86	404	**77**	89	394	**87**	91	.471
3533	Unify	910	497	**88**	91	486	**97**	94	473	**105**	96	461	**113**	98	449	**122**	100	438	**131**	102	.421
4500 SERIES																					
4511	Union	900	429	**24**	76	419	**34**	79	409	**45**	81	398	**53**	83	387	**64**	86	376	**72**	88	.485
4512	Unity	900	486	**81**	90	475	**90**	92	464	**99**	95	451	**107**	96	440	**116**	99	428	**122**	101	.428
4513	Unlaw	900	543	**138**	104	531	**146**	106	518	**153**	108	505	**161**	110	492	**168**	112	480	**175**	113	.370
4521	Unman	1025	468	**8**	72	457	**20**	74	447	**31**	77	434	**42**	79	424	**55**	82	413	**66**	85	.501
4522	Unpin	1025	530	**68**	85	518	**79**	87	505	**89**	89	492	**99**	91	480	**110**	94	467	**120**	96	.447
4523	Unpeg	1025	590	**128**	98	576	**137**	100	562	**146**	102	548	**155**	104	534	**164**	106	520	**173**	108	.394
4531	Unoil	1170	510	**–**	67	500	**0**	70	487	**13**	73	475	**27**	75	462	**40**	78	448	**54**	80	.520
4532	Unrig	1170	573	**48**	79	563	**62**	82	547	**74**	84	534	**86**	86	520	**99**	89	507	**112**	91	.471
4533	Untie	1170	639	**113**	91	623	**124**	94	608	**135**	96	592	**146**	98	578	**157**	100	564	**169**	102	.421
5500 SERIES																					
5511	Upper	1100	525	**30**	76	513	**42**	79	500	**55**	81	487	**65**	83	473	**78**	86	460	**89**	88	.485
5512	Upset	1100	594	**99**	90	582	**110**	92	567	**121**	95	552	**131**	96	538	**142**	99	523	**151**	101	.428
5513	Urban	1100	663	**169**	104	649	**178**	106	632	**187**	108	617	**196**	110	602	**206**	112	586	**214**	113	.370
5521	Usage	1250	571	**9**	72	558	**24**	74	544	**38**	77	530	**51**	79	517	**67**	82	503	**82**	85	.501
5522	Usher	1250	645	**83**	85	630	**96**	87	615	**108**	89	598	**120**	91	583	**134**	94	568	**147**	96	.447
5523	Usual	1250	718	**156**	98	700	**167**	100	684	**178**	102	667	**189**	104	650	**200**	106	633	**212**	108	.394
5531	Usurp	1425	622	**–**	67	609	**0**	70	593	**16**	73	578	**33**	75	563	**49**	78	547	**65**	80	.520
5532	Utile	1425	700	**59**	79	685	**76**	82	668	**90**	84	650	**105**	86	634	**120**	89	617	**136**	91	.471
5533	Utter	1425	779	**137**	91	760	**151**	94	741	**164**	96	722	**178**	98	705	**191**	100	687	**206**	102	.421

All rated capacities are based on a steam temperature in the radiators of 218° F. and on an air delivery determined by the A. S. H. & V. E. standard anemometer method over the net area of the discharge outlet.

For each series there are three rated air deliveries with outlet velocities ranging from 800 to 1000 f.p.m.

The total capacity (equivalent square feet of direct radiation) shown in light figures, should be used to determine boiler, piping, trap and valve sizes.

Bold face figures indicate the additional heating capacity (equivalent square feet of direct radiation) available for warming the room to 70° F. after ventilation requirements have been taken care of.

MODELS O—W—WR

CAPACITY TABLES

FOR ENTERING AIR TEMPERATURES 0° F. AND ABOVE

Serial No.	Code Word	Cu. ft. of air per min.	Total Capacities, Heating Capacities and Final Temperatures at various entering air temperatures. 0°			+10°			+20°			+30°			+40°			+70°			Increment
			Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	
2500 SERIES																					
2511	Uhlan	500	203	**46**	90	193	**58**	96	181	**68**	100	168	**78**	105	158	**90**	110	123	**123**	125	.485
2512	Ulmus	500	232	**74**	103	219	**84**	107	206	**93**	111	193	**103**	116	180	**113**	120	141	**141**	133	.428
2513	Ulnar	500	259	**102**	115	245	**110**	119	231	**119**	123	217	**127**	126	203	**135**	130	160	**160**	141	.370
2521	Ultra	570	223	**44**	87	212	**58**	93	197	**69**	97	184	**82**	102	172	**95**	107	133	**133**	122	.501
2522	Umber	570	252	**73**	98	238	**85**	103	224	**95**	107	210	**107**	112	197	**120**	117	153	**153**	130	.447
2523	Unarm	570	281	**102**	110	266	**112**	114	250	**122**	118	235	**132**	122	220	**144**	126	173	**173**	137	.394
2531	Unapt	650	242	**37**	83	228	**52**	88	214	**67**	93	200	**83**	99	187	**100**	104	143	**143**	119	.520
2532	Unbag	650	273	**68**	93	258	**82**	98	242	**96**	103	227	**110**	108	214	**126**	113	165	**165**	126	.471
2533	Unbid	650	304	**100**	104	288	**112**	108	270	**124**	113	254	**137**	117	237	**149**	121	186	**186**	134	.421
3500 SERIES																					
3511	Uncap	700	285	**64**	90	270	**81**	96	252	**95**	100	236	**110**	105	221	**126**	110	172	**172**	125	.485
3512	Uncia	700	324	**104**	103	306	**118**	107	288	**130**	111	270	**144**	116	252	**158**	120	198	**198**	133	.428
3513	Uncus	700	364	**143**	115	343	**154**	119	323	**166**	123	304	**178**	126	284	**189**	130	224	**224**	141	.370
3521	Under	800	313	**61**	87	298	**82**	93	277	**96**	97	259	**115**	102	241	**133**	107	187	**187**	122	.501
3522	Undue	800	354	**102**	98	335	**119**	103	314	**134**	107	294	**150**	112	278	**169**	117	214	**214**	130	.447
3523	Unfix	800	394	**143**	110	373	**157**	114	351	**171**	118	330	**186**	122	310	**202**	126	242	**242**	137	.394
3531	Unhap	910	339	**52**	83	319	**73**	88	299	**94**	93	280	**117**	99	262	**139**	104	201	**201**	119	.520
3532	Uniat	910	382	**96**	93	361	**115**	98	339	**134**	103	318	**154**	108	299	**176**	113	231	**231**	126	.471
3533	Unify	910	427	**139**	104	407	**157**	108	379	**174**	113	355	**190**	117	332	**209**	121	260	**260**	134	.421
4500 SERIES																					
4511	Union	900	366	**82**	90	347	**103**	96	324	**122**	100	303	**141**	105	284	**162**	110	220	**220**	125	.485
4512	Unity	900	417	**133**	103	393	**151**	107	370	**168**	111	347	**185**	116	324	**202**	120	254	**254**	133	.428
4513	Unlaw	900	467	**183**	115	440	**198**	119	416	**213**	123	390	**228**	126	365	**243**	130	288	**288**	141	.370
4521	Unman	1025	402	**78**	87	382	**102**	93	354	**123**	97	332	**147**	102	309	**171**	107	239	**239**	122	.501
4522	Unpin	1025	454	**131**	98	430	**153**	103	403	**172**	107	378	**192**	112	355	**212**	117	275	**275**	130	.447
4523	Unpeg	1025	507	**183**	110	478	**200**	114	450	**219**	118	423	**238**	122	397	**258**	126	310	**310**	137	.394
4531	Unoil	1170	436	**67**	83	410	**94**	88	384	**121**	93	360	**150**	99	337	**179**	104	258	**258**	119	.520
4532	Unrig	1170	492	**123**	93	464	**148**	98	437	**173**	103	408	**198**	108	384	**226**	113	297	**297**	126	.471
4533	Untie	1170	547	**179**	104	518	**202**	108	487	**224**	113	457	**246**	117	427	**268**	121	335	**335**	134	.421
5500 SERIES																					
5511	Upper	1100	448	**101**	90	424	**127**	96	397	**149**	100	370	**173**	105	346	**198**	110	270	**270**	125	.485
5512	Upset	1100	509	**163**	103	481	**184**	107	453	**205**	111	423	**226**	116	395	**247**	120	311	**311**	133	.428
5513	Urban	1100	571	**224**	115	538	**242**	119	508	**260**	123	477	**279**	126	445	**297**	130	352	**352**	141	.370
5521	Usage	1250	490	**96**	87	465	**123**	93	432	**151**	97	404	**179**	102	376	**208**	107	292	**292**	122	.501
5522	Usher	1250	553	**159**	98	523	**186**	103	490	**210**	107	460	**234**	112	433	**264**	117	335	**335**	130	.447
5523	Usual	1250	616	**223**	110	582	**245**	114	548	**267**	118	515	**291**	122	483	**315**	126	378	**378**	137	.394
5531	Usurp	1425	532	**82**	83	500	**115**	88	468	**147**	93	440	**183**	99	410	**218**	104	314	**314**	119	.520
5532	Utile	1425	600	**150**	93	566	**181**	98	531	**210**	103	498	**241**	108	468	**276**	113	362	**362**	126	.471
5533	Utter	1425	667	**218**	104	632	**246**	108	593	**272**	113	556	**300**	117	520	**327**	121	407	**407**	134	.421

The last column shows the increment to be added or deducted to the final temperature per degree change in entering air temperature.

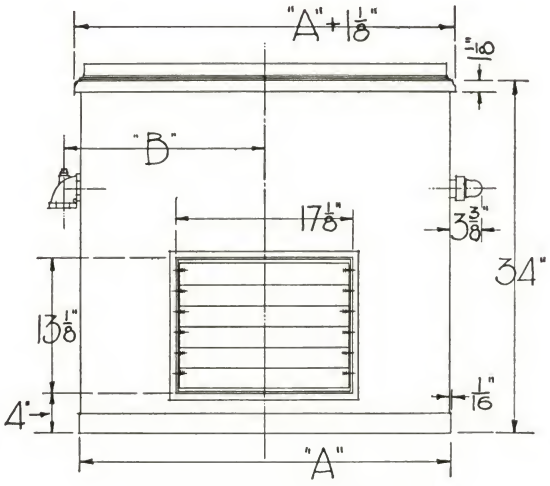
If it be desired to find the final temperature of a given machine when the entering air temperature is —35°, subtract the increment multiplied by 5 from the final temperature shown in the —30° column.

If it be desired to find the final temperature when the entering air is +35°, add the increment multiplied by 5 to the final temperature shown in the +30° column.

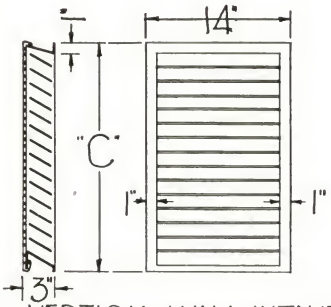
Note that the increment is added for higher entering air temperatures and subtracted for lower entering air temperatures.

· MODEL · SD · DIMENSIONS

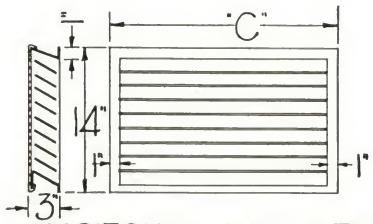
· CODE WORD · WAFER ·



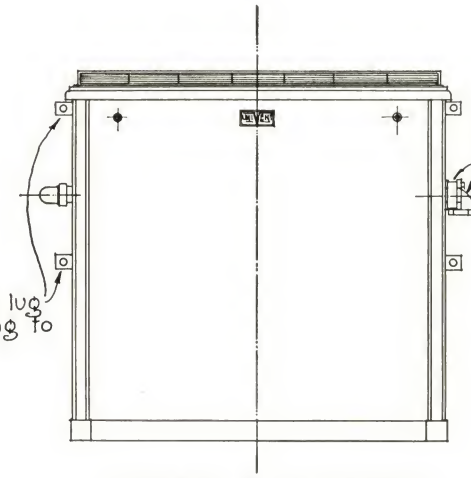
· REAR · ELEVATION ·



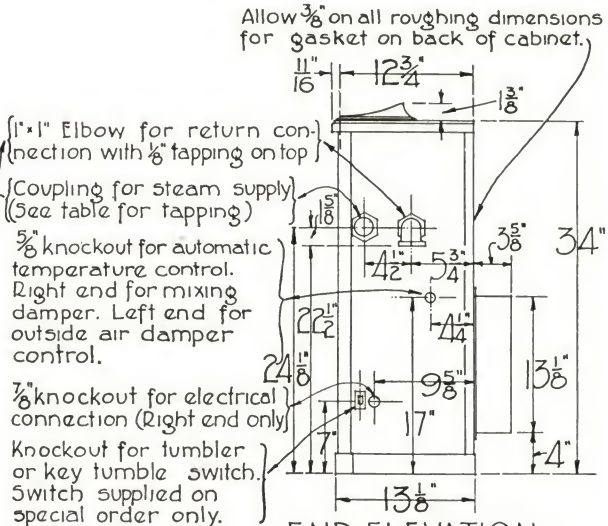
· VERTICAL · WALL · INTAKE ·



· HORIZONTAL · WALL · INTAKE ·



· FRONT · ELEVATION ·



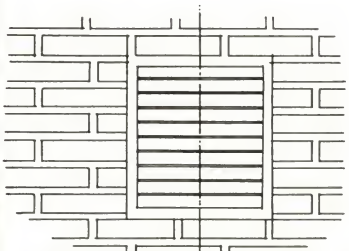
· END · ELEVATION ·

Dimensions given above are same for all series.
Values of lettered dimensions are given in table.

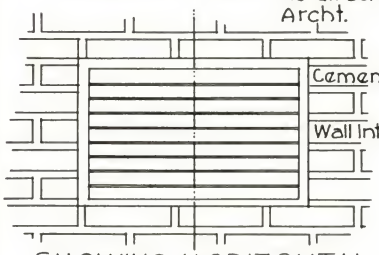
SERIES NUMBER	A	B	C	Steam Connections	
				Supply	Return.
2500 - SERIES	25⅞"	14⅞"	18"	1"	1"
3500 - SERIES	35⅞"	19⅞"	22"	1¼"	1"
4500 - SERIES	45⅞"	24⅞"	26"	1½"	1"
5500 - SERIES	55⅞"	29⅞"	32"	1½"	1"

"B" is roughing dimension from ℄ of Univent to face of supply coupling and to ℄ of return elbow when supply & return are on same end.
For roughing dimension when supply & return on opposite ends see piping connections.

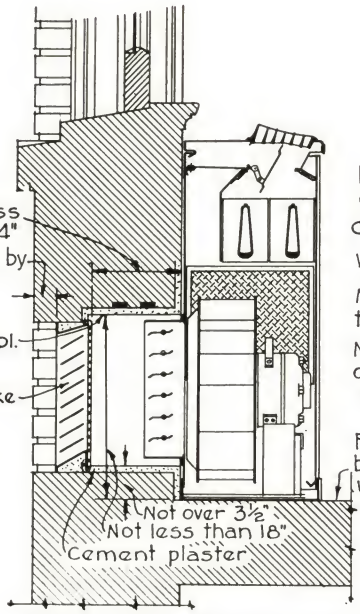
MODEL SD APPLICATIONS



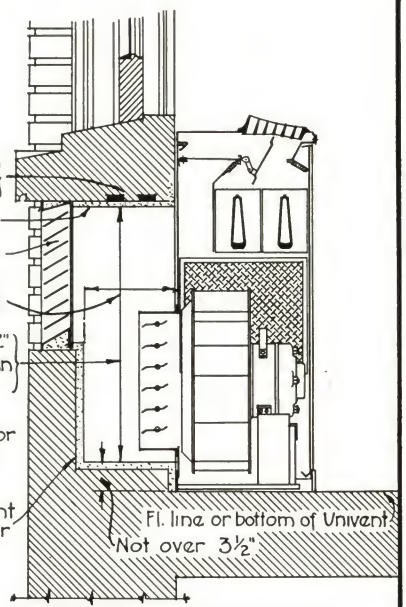
SHOWING VERTICAL WALL INTAKE



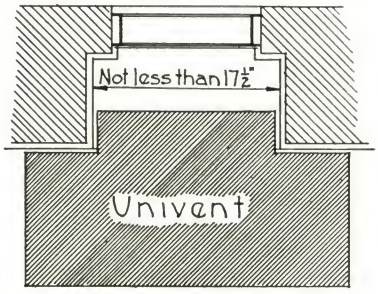
SHOWING HORIZONTAL WALL INTAKE



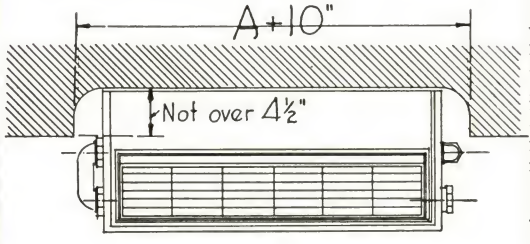
SECTION SHOWING STANDARD LOCATION OF INTAKE



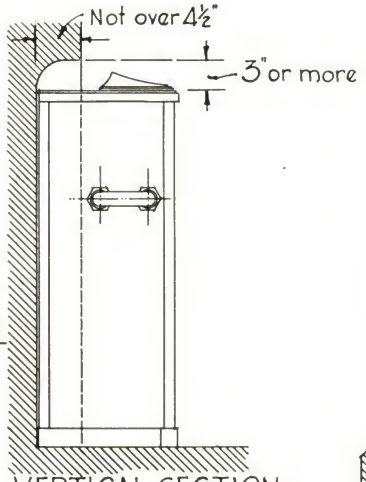
SECTION SHOWING HIGH LOCATION OF INTAKE



HORIZONTAL SECTION THRU WALL INTAKE

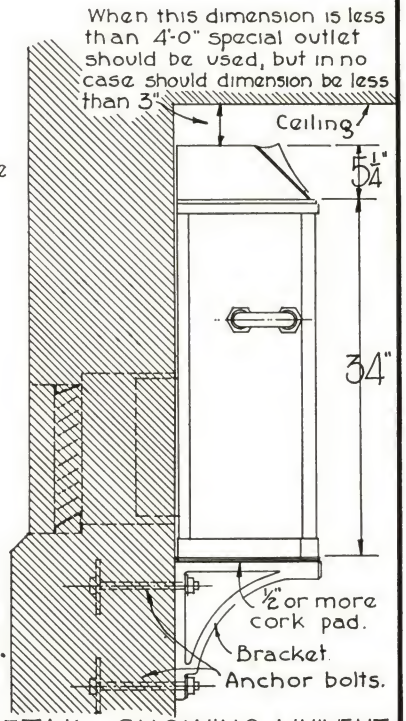


HORIZONTAL SECTION SHOWING APPROVED METHOD OF RECESSING



VERTICAL SECTION SHOWING APPROVED METHOD OF RECESSING

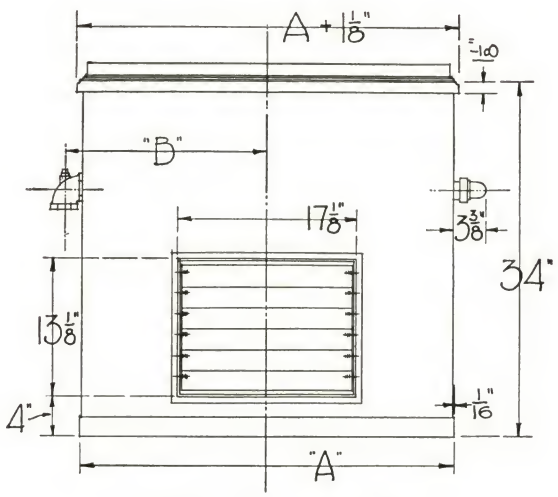
It is advisable to build recess larger than cabinet as shown. If this cannot be done openings should be cased to insure neat fit.



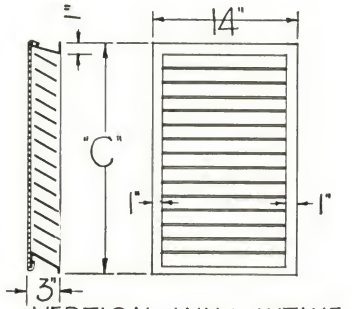
DETAIL SHOWING UNIVENT SUSPENDED NEAR CEILING WITH SUPPORTING BRACKET AND SPECIAL OUTLET

· MODEL · R · DIMENSIONS ·

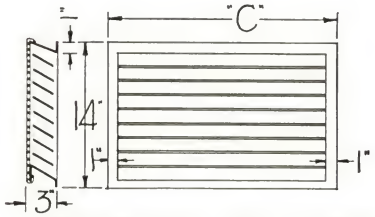
· CODE WORD · WAKIF ·



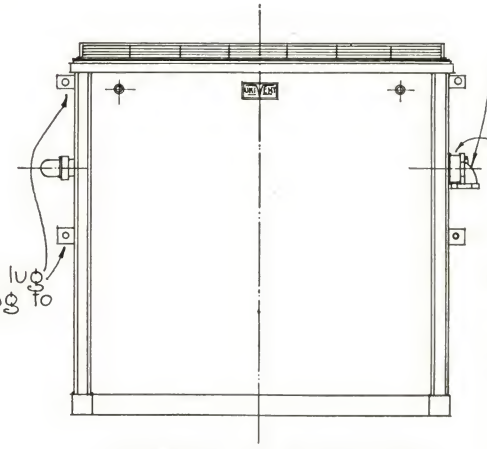
· REAR · ELEVATION ·



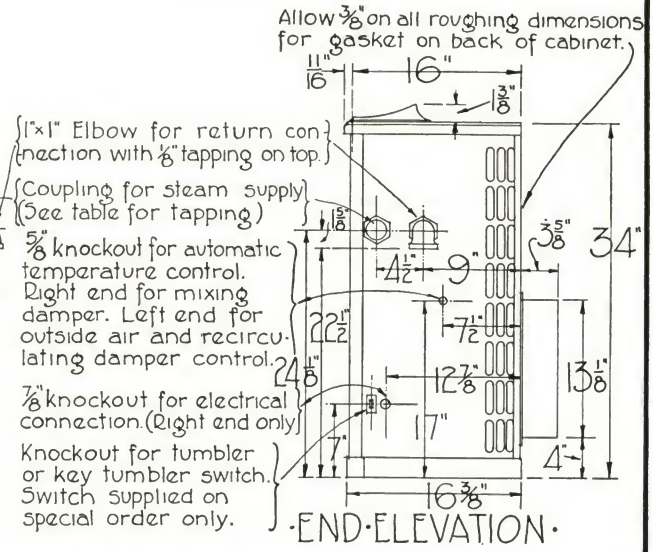
· VERTICAL · WALL · INTAKE ·



HORIZONTAL · WALL · INTAKE ·



· FRONT · ELEVATION ·



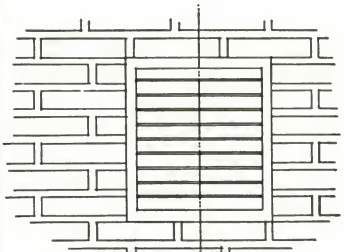
· END · ELEVATION ·

Dimensions given above are same for all series.
Values of lettered dimensions are given in table

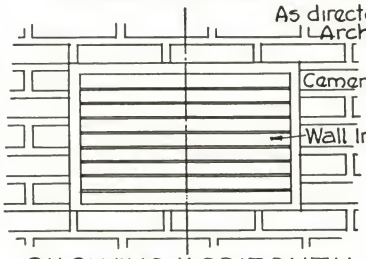
SERIES NUMBER	A	B	C	Steam Connections Supply	Steam Connections Return
2500 - SERIES	25 7/8"	14 7/8"	18"	1"	1"
3500 - SERIES	35 7/8"	19 7/8"	22"	1 1/4"	1"
4500 - SERIES	45 7/8"	24 7/8"	26"	1 1/2"	1"
5500 - SERIES	55 7/8"	29 7/8"	32"	1 1/2"	1"

"B" is roughing dimension from ℄ of univent to face of supply coupling and to ℄ of return elbow when supply & return are on same end.
For roughing dimension when supply & return on opposite ends see piping connections.

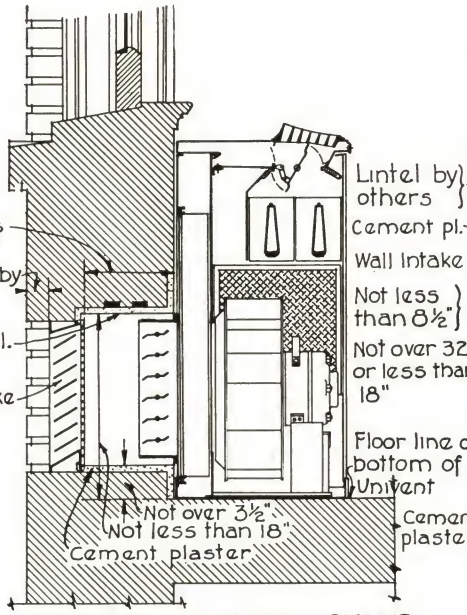
·MODEL· R ·APPLICATIONS·



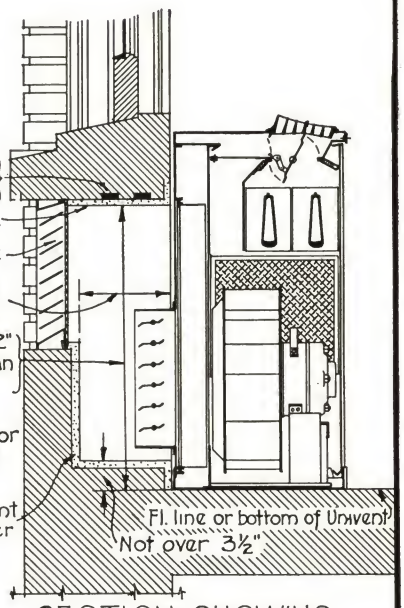
SHOWING VERTICAL WALL ·INTAKE



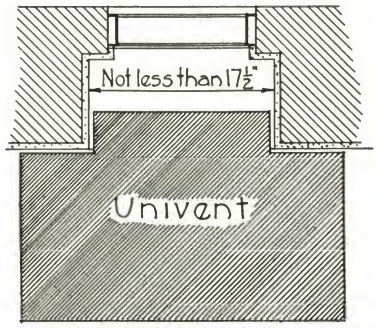
SHOWING·HORIZONTAL· ·WALL·INTAKE·



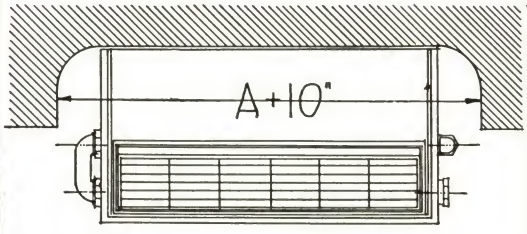
·SECTION·SHOWING·STANDARD·LOCATION·OF·INTAKE



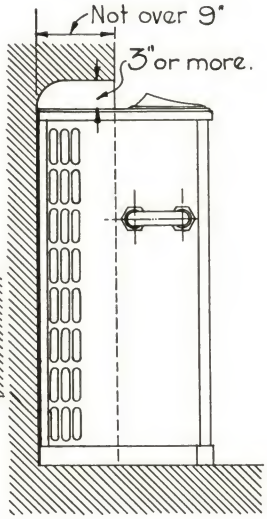
SECTION·SHOWING· HIGH·LOCATION·OF·INTAKE·



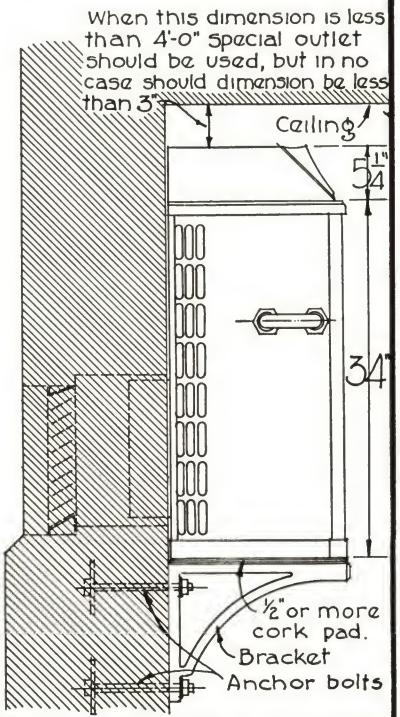
·HORIZONTAL·SECTION· ·THRU·WALL·INTAKE·



·HORIZONTAL·SECTION· ·SHOWING·APPROVED· ·METHOD·OF·RECESSING·



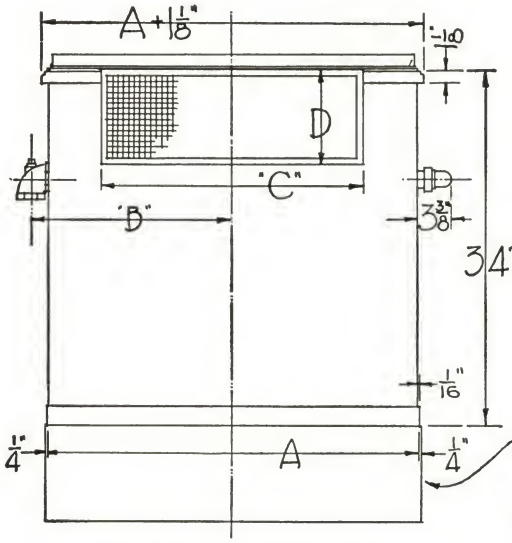
·VERTICAL·SECTION· ·SHOWING·APPROVED· METHOD·OF·RECESSING·



·DETAIL·SHOWING·UNIVENT· ·SUSPENDED·NEAR·CEILING· WITH·SUPPORTING·BRACKET· AND·SPECIAL·OUTLET··

· MODEL · O · DIMENSIONS ·

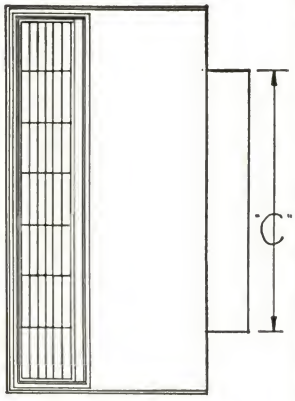
· CODE "WORD" · WATCH ·



· REAR · ELEVATION ·

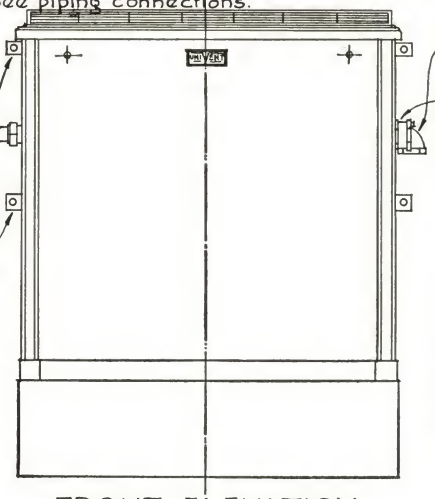
NOTE #1

Sub bases furnished on special order only. Always give dimension "F" on order. "F" cannot be more than 50"



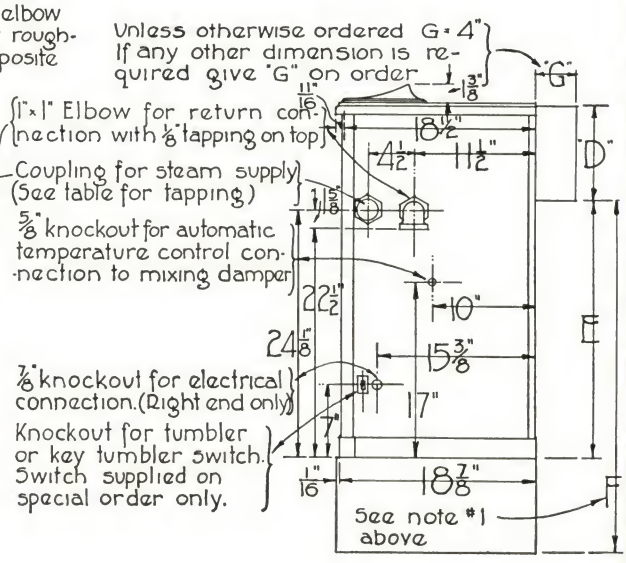
· PLAN ·

"B" is roughing dimension from ℄ of Univent to face of supply coupling and to ℄ of return elbow when supply & return are on same end For roughing dimension when supply & return are on opposite ends see piping connections.



· FRONT · ELEVATION ·

Unless otherwise ordered G = 4" If any other dimension is required give "G" on order

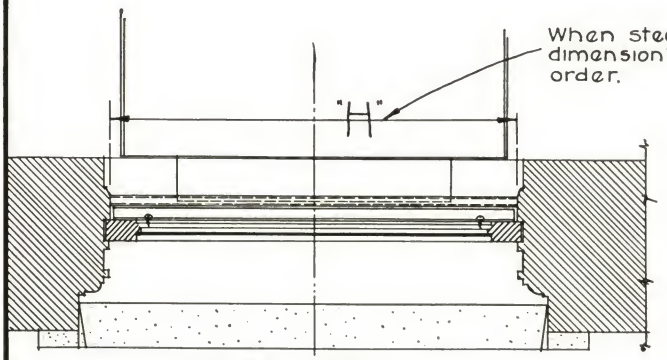


· END · ELEVATION ·

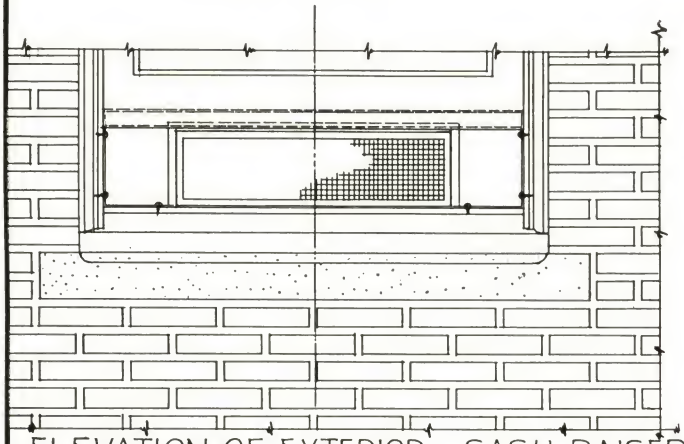
Dimensions given above are same for all series.
Values of lettered dimensions are given in table

SERIES NUMBER	A	B	C	D	E	Steam Connections	
						Supply	Return
2500 SERIES	25 7/8"	14 7/8"	18 1/8"	7/8"	26 3/4"	1"	1"
3500 SERIES	35 7/8"	19 7/8"	26 1/8"	7/8"	26 3/4"	1 1/4"	1"
4500 SERIES	45 7/8"	24 7/8"	36 1/8"	7/8"	26 3/4"	1 1/2"	1"
5500 SERIES	55 7/8"	29 7/8"	36 1/8"	9/8"	24 3/4"	1 1/2"	1"

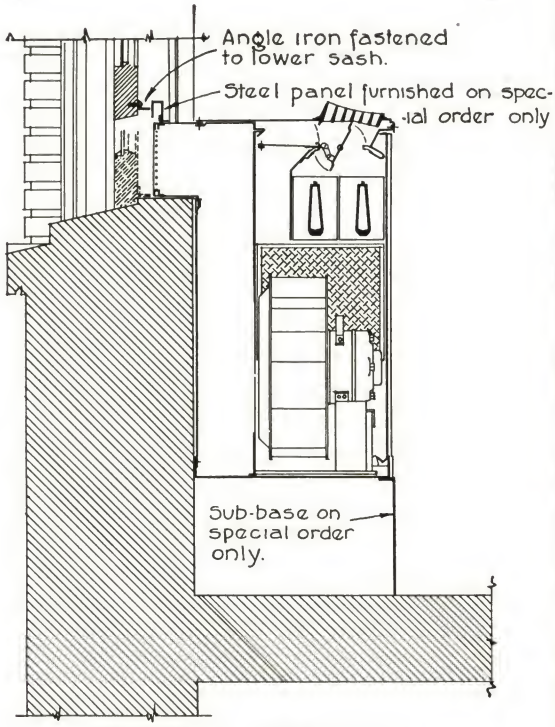
· MODEL · 0 · APPLICATIONS ·



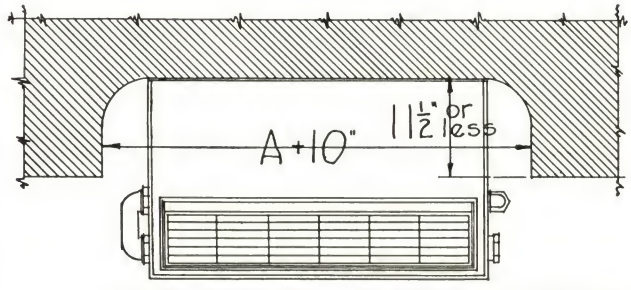
· PLAN · VIEW ·



· ELEVATION · OF · EXTERIOR · · SASH · RAISED · · SHOWING · INTAKE · & · STEEL · PANEL · ·



SECTION · SHOWING · · UNIVENT · INTAKE · INSIDE · OF · · WINDOW · · SASH · TO · BE · · RAISED · FOR · OUTSIDE · AIR · ·

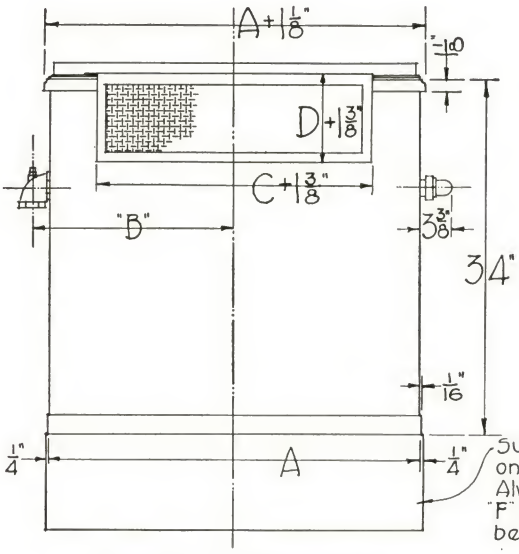


· HORIZONTAL · SECTION · SHOWING · APPROVED · METHOD · OF · · RECESSING · ·

It is advisable to build recess larger than cabinet as shown. If this cannot be done openings should be cased to insure neat fit.

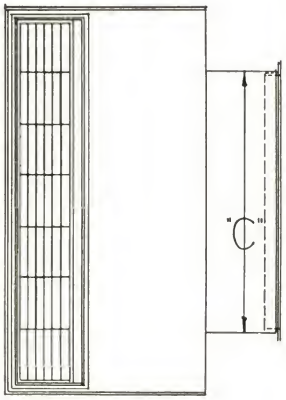
· MODEL · W · DIMENSIONS ·

· CODE WORD "WALTZ" ·



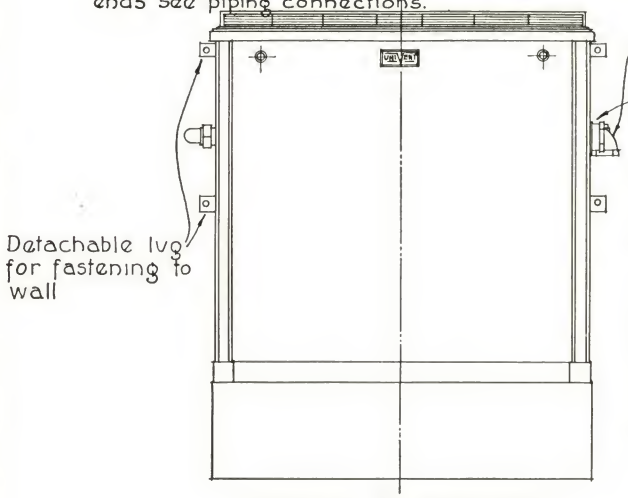
· REAR · ELEVATION ·

NOTE #1.
Sub bases furnished on special order only. Always give dimension "F" on order. "F" cannot be more than 50"



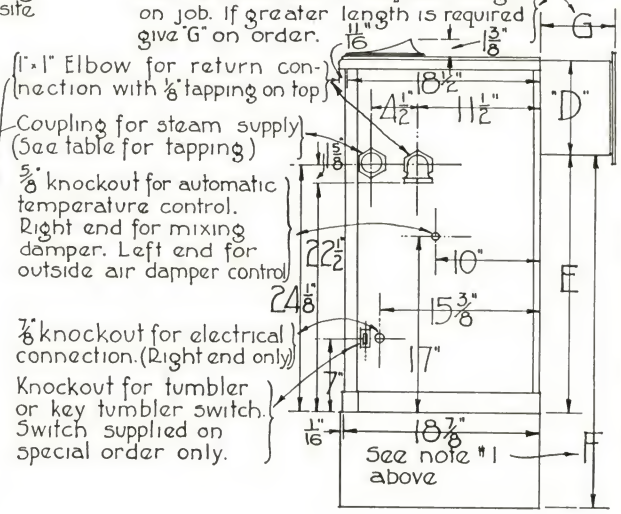
· PLAN ·

"B" is roughing dimension from ℄ of Univent to face of supply coupling and to ℄ of return elbow when supply & return are on same end. For roughing dimension when supply & return are on opposite ends see piping connections.



· FRONT · ELEVATION ·

Unless otherwise ordered G = 12" and is to be cut to required length on job. If greater length is required give "G" on order.

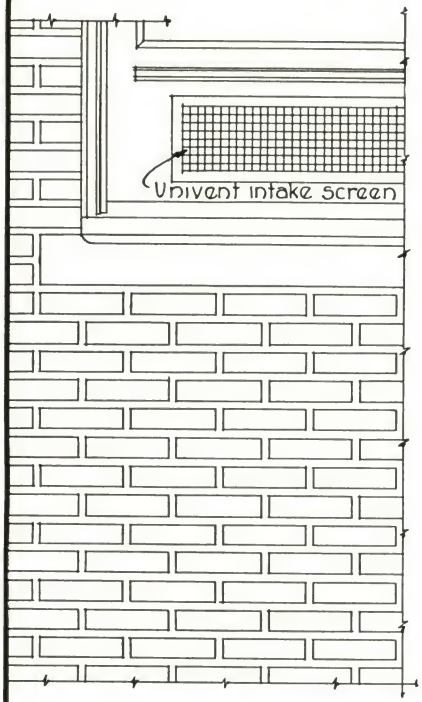


· END · ELEVATION ·

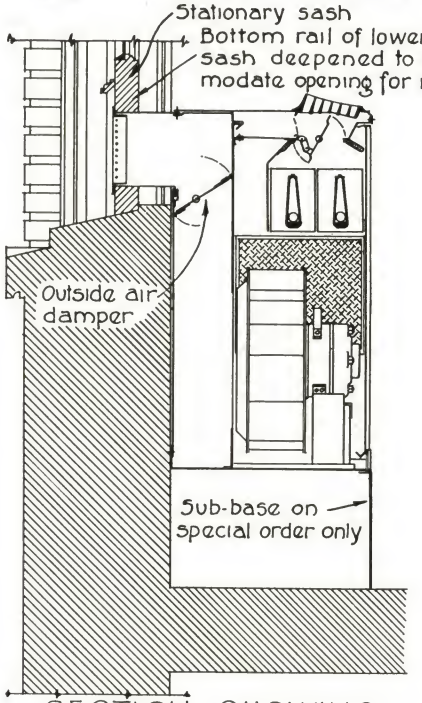
Dimensions given above are same for all series.
Values of lettered dimensions are given in table

· SERIES · NUMBER	A	B	C	D	E	Steam Connections	
						Supply	Return
· 2500 · SERIES ·	25 7/8"	14 7/8"	18 1/8"	7 1/8"	26 3/4"	1"	1"
· 3500 · SERIES	35 7/8"	19 7/8"	26 1/8"	7 1/8"	26 3/4"	1 1/4"	1"
· 4500 · SERIES	45 7/8"	24 7/8"	36 1/8"	7 1/8"	26 3/4"	1 1/2"	1"
· 5500 · SERIES	55 7/8"	29 7/8"	36 1/8"	9 1/8"	24 3/4"	1 1/2"	1"

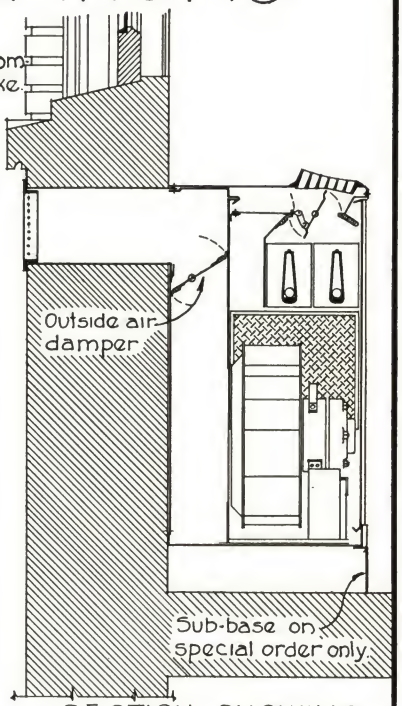
MODEL W APPLICATIONS



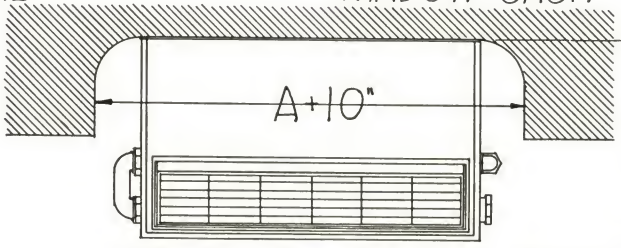
ELEVATION OF EXTERIOR SHOWING UNIVENT INTAKE



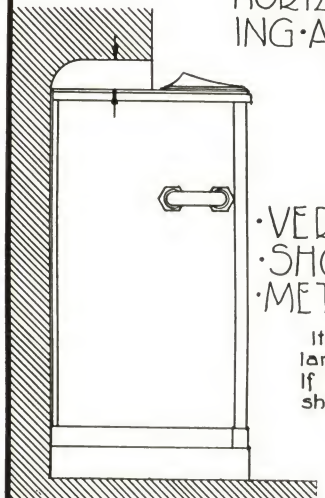
SECTION SHOWING UNIVENT WITH INTAKE THRU LOWER RAIL OF WINDOW SASH



SECTION SHOWING UNIVENT WITH INTAKE THRU WALL BELOW WINDOW SILL



HORIZONTAL SECTION SHOWING APPROVED METHOD OF RECESSING

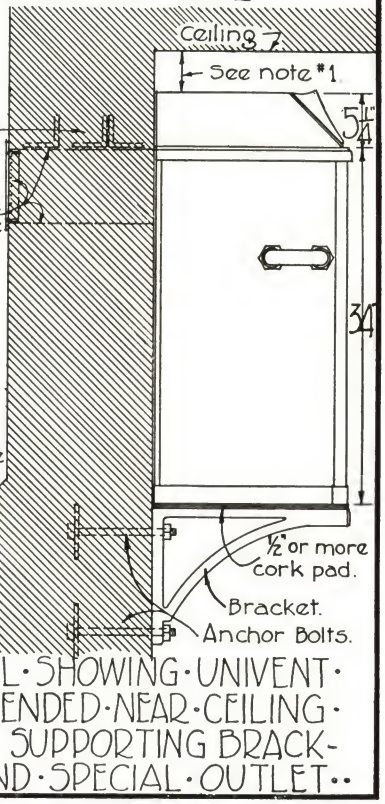


VERTICAL SECTION SHOWING APPROVED METHOD OF RECESSING

It is advisable to build recess larger than cabinet as shown. If this cannot be done openings should be cased to insure neat fit.

NOTE #1

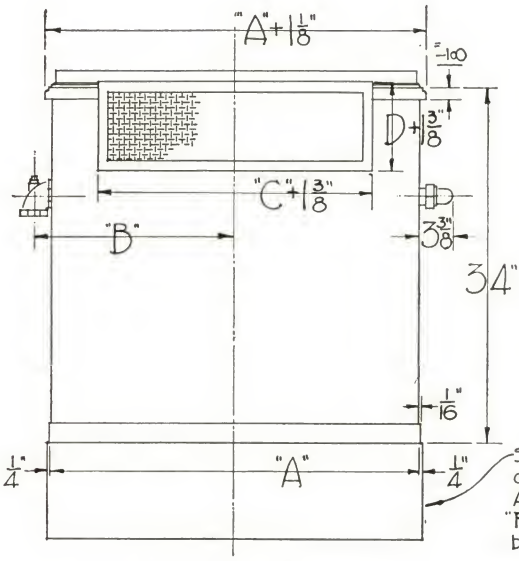
When the above dimension is less than 4'-0" special outlet should be used, but in no case should dimension be less than 3"



DETAIL SHOWING UNIVENT SUSPENDED NEAR CEILING WITH SUPPORTING BRACKET AND SPECIAL OUTLET

MODEL WR DIMENSIONS

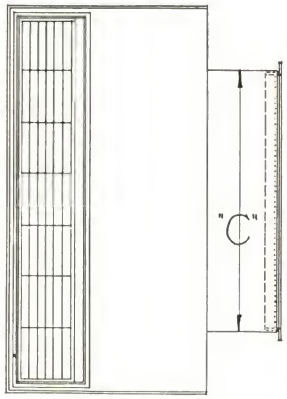
CODE WORD "WACKE"



·REAR·ELEVATION·

·NOTE-1·

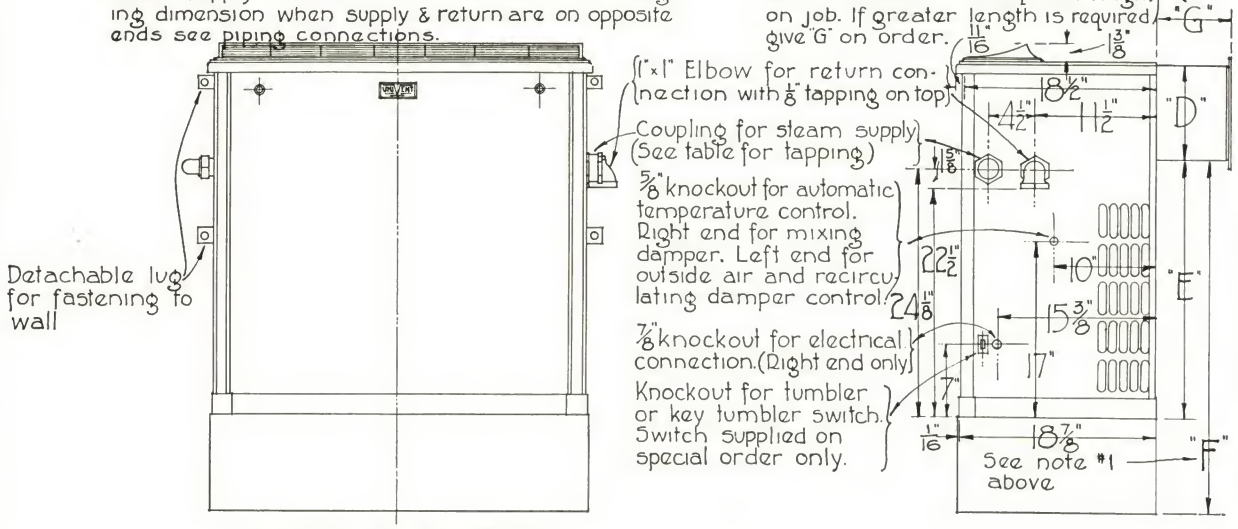
Sub bases furnished on special order only. Always give dimension "F" on order. "F" cannot be more than 50"



·PLAN·

"B" is roughing dimension from ℄ of Univent to face of supply coupling and to ℄ of return elbow when supply & return are on same end. For roughing dimension when supply & return are on opposite ends see piping connections.

Unless otherwise ordered G=12" and is to be cut to required length on job. If greater length is required give "G" on order.



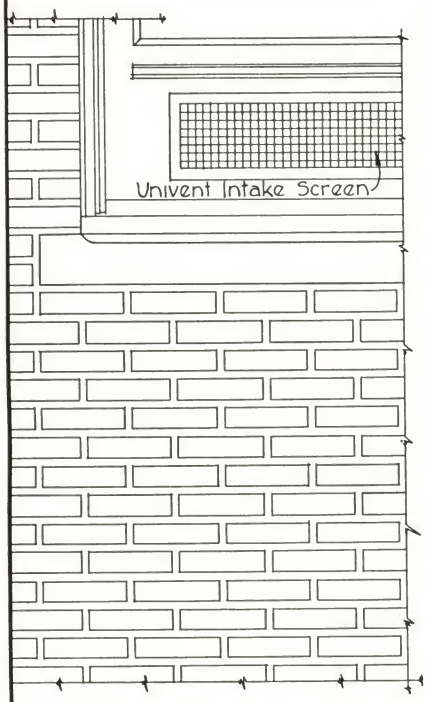
FRONT ELEVATION

·END·ELEVATION·

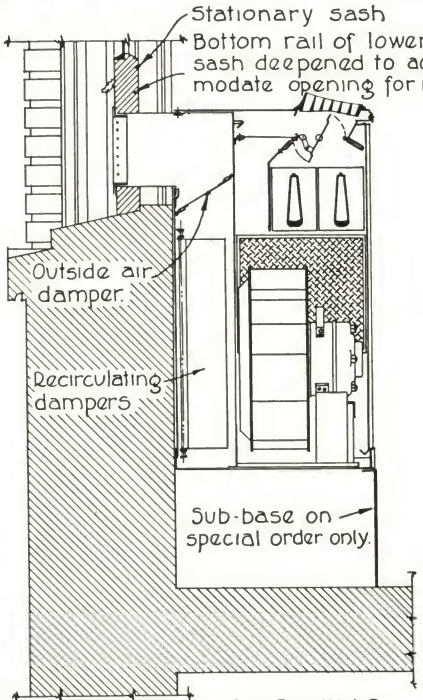
Dimensions given above are same for all series. Values of lettered dimensions are given in table.

SERIES NUMBER	A	B	C	D	E	Steam Connections	
						Supply	Return
2500 SERIES	25⅞"	14⅞"	18⅛"	7⅛"	26¾"	1"	1"
3500 SERIES	35⅞"	19⅞"	26⅛"	7⅛"	26¾"	1¼"	1"
4500 SERIES	45⅞"	24⅞"	36⅛"	7⅛"	26¾"	1½"	1"
5500 SERIES	55⅞"	29⅞"	36⅛"	9⅛"	24¾"	1½"	1"

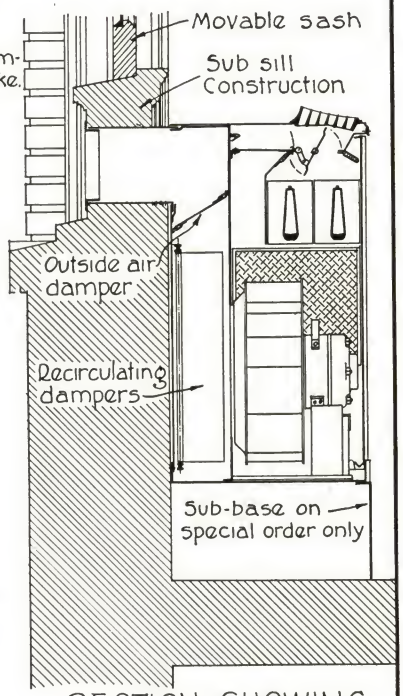
MODEL WR APPLICATIONS



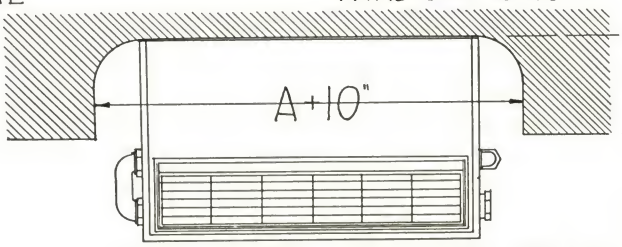
ELEVATION OF EXTERIOR SHOWING UNIVENT INTAKE



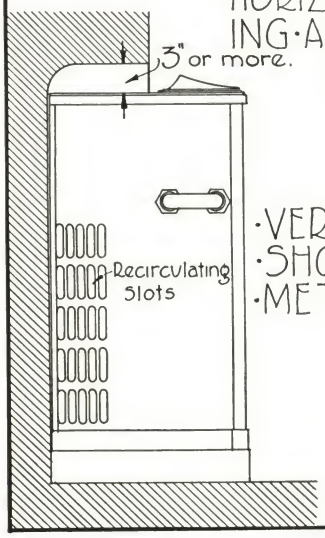
SECTION SHOWING UNIVENT WITH INTAKE THRU LOWER RAIL OF WINDOW SASH



SECTION SHOWING UNIVENT WITH INTAKE THRU SUB-SILL WINDOW CONSTRUCTION

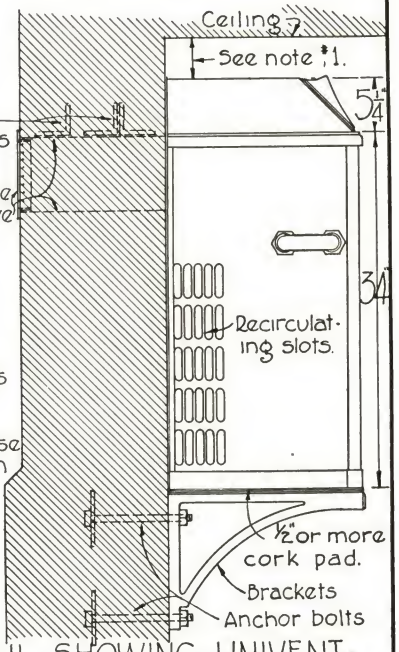


HORIZONTAL SECTION SHOWING APPROVED METHOD OF RECESSING



VERTICAL SECTION SHOWING APPROVED METHOD OF RECESSING

NOTE *1
When the above dimension is less than 4'-0" special outlet should be used, but in no case should dimension be less than 3"



DETAIL SHOWING UNIVENT SUSPENDED NEAR CEILING WITH SUPPORTING BRACKET AND SPECIAL OUTLET

Wiring Data

Method

The method of wiring recommended for Univent Her-Nel-Co motors is the same as that recommended for any standard motor. Due to their special electrical characteristics, Her-Nel-Co single-phase motors may be connected to the several phases of a two or three-phase service as shown below. Where a number of Univents are used it is recommended that independent circuits be provided for the Univent motors. It is advisable on large jobs to provide a separate circuit for each group.

Electrical wall outlets should be installed at each Univent close to the floor and at the right-hand end of the cabinet, as one stands facing it. Connections between such wall outlets and in the Univent cabinet should be in rigid, flat, or flexible conduit.

Her-Nel-Co Univent motors are furnished for the following current characteristics shown in the accompanying table.

Type of current	Number of phases	Frequency	Voltage	Code word	Approx. amperes per lead
Alternating	1	25	110	Macar	3.10
			220	Macho	1.55
		30	110	Macle	2.00
			220	Maize	1.00
		50	110	Maleo	2.60
			220	Malic	1.30
		60	110	Malva	2.20
			220	Mango	1.10
	3	50	220	Meros	1.20
		60	220	Monal	1.00
Direct			110-125	Moray	1.60
			220-250	Mosey	.80

Note: The above data will be found useful in determining wire, switch, fuse sizes, etc.

Wire Sizes

All Her-Nel-Co Univent motors should be wired as shown below. All wires shall be so sized that the maximum voltage drop at the last motor on the line does not exceed 3 volts.

Switches

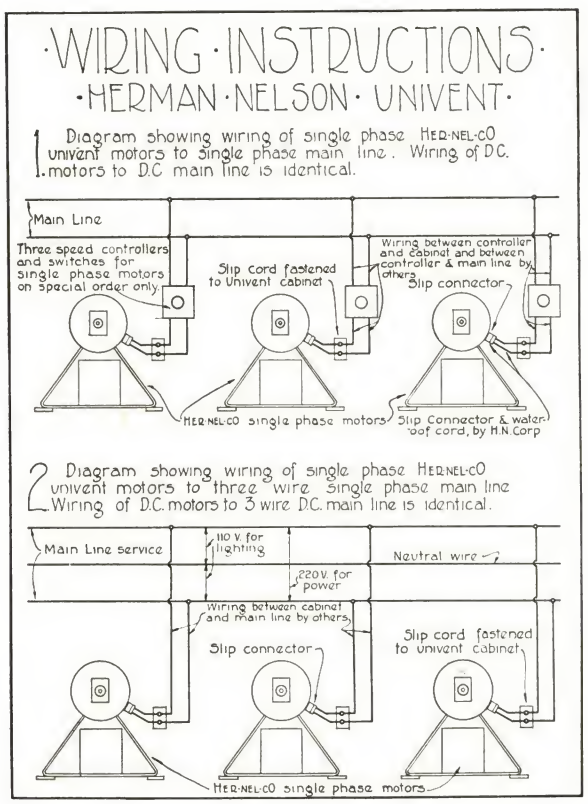
On special order, Univent cabinets will be provided with flush tumbler or key tumbler switches to start and stop the Univent as shown on pages 52 to 61. In all cases, the Univent motors may be readily disconnected by means of the slip connector provided on each motor.

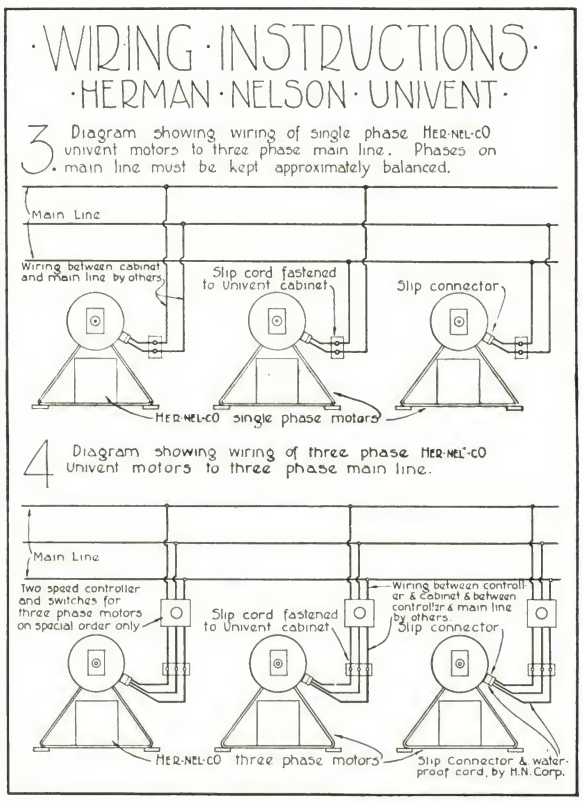
Speed Adjustment

All Her-Nel-Co Univent motors are of the adjustable speed type and are shipped from the factory with the correct speed adjustment. However, if further adjustment is required, it should be done by the heating contractor. Full instructions are furnished with each motor.

Approvals

The Univent is approved by the National Board of Fire Underwriters of the United States and the Hydro Electric Power Commission of Ontario, Canada.





Piping Suggestions

In general, Univents are piped exactly the same as radiators having a capacity equivalent to the total capacity of the Univent.

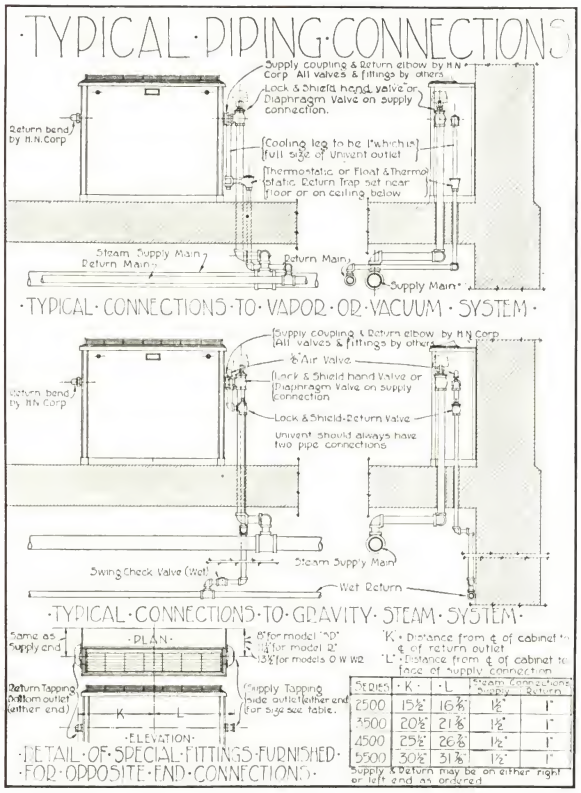
Tappings

Univents are provided with 1, 1¼ and 1½-in. female supply connections, depending on the size of the Univent, and 1-in. return elbow for all sizes as shown on pages 52 to 61. They may be arranged for supply and return at opposite ends or at the same end. Unless otherwise ordered, Univents are shipped with the supply and return at the right end, as one faces the cabinet, with the supply connections in front.

When the supply and return connections are at the same end, the supply connections should be made to the front radiator section and the return to the rear section. It is recommended that all hand valves be of the lock shield type.

Gravity Systems

When connected to a gravity system, all Univents should have two pipe connections, even though all other radiators on the job have a one pipe connection. The return elbow is provided with a special vent tapping in which an air valve should be installed on a gravity system.



Series	K	L	Steam Connections Supply	Steam Connections Return
2500	15½"	16⅝"	1¼"	1"
3500	20½"	21⅛"	1½"	1"
4500	25½"	26⅝"	1½"	1"
5500	30½"	31⅛"	1½"	1"

Hot Water Systems

When hot water circulating systems are used, the Univent will be furnished with return connections the same size as the supply connection on any given Univent as shown on pages 52 to 61. For hot water service, the Univent radiator sections will also be equipped with special air vent tappings at the top into which the heating contractor shall install hand-operated air valves for the purpose of venting the radiators. Opposite end connections are recommended for hot water installations in order to have the length of travel through the radiators as short as possible. It is not recommended that gravity systems of hot water circulation be used with Univents. Forced circulation is always recommended.

Vapor and Vacuum Systems

For vapor and vacuum systems, the traps may be of the thermostatic or combination float and thermostatic type. Where plain thermostatic traps are used, it is essential that a drop cooling leg be provided to cool the condensate before it enters the trap.

Automatic Temperature Control Valves

If automatic temperature control is applied to the Univent radiators, the diaphragm supply valves should always be installed on the front section when the supply and return connections are at the same end.

Humidifiers

On special order, Univents will be equipped with humidifiers which consist of a long brass tube with venturi nozzles installed above the radiator. This tube is connected to the tapping at the top of the return ell or manifold. For hand control a small angle valve is provided in this connection. For automatic humidity control, a diaphragm valve should be installed in this connection and arranged to be controlled by a room humidostat. When humidifiers are used it is advisable to increase the boiler size accordingly and to provide automatic water feeders.

THE HERMAN NELSON VOLUVENT

There are many cases where some ventilation is desired but where an elaborate system is impractical. The Herman Nelson Voluvent, a large capacity, quiet operating, compact heating and ventilating unit for auditoriums, theatres, gymnasiums, natatoriums and other large spaces, meets this situation. It is sold strictly as a piece of equipment to deliver warmed air into a room and to be applied in any way that the purchaser sees fit.

It should be understood that since the Voluvent is not designed to meet specific conditions, results will depend upon its application. While intended as an inexpensive means of ventilation, it is by no means a cheap article, being on a par with all Herman Nelson products in design, workmanship and material.

Furnished in Five Series

The Voluvent is furnished in five series, namely, the No. 130 Series, No. 130SD Series, No. 130R Series, No. 210 Series and No. 360 Series. Each series has a large range of air deliveries and heating capacities. These large ranges of air deliveries are made possible by the use of the Her-Nel-Co variable speed motor and the Her-Nel-Co Speed Controller. The large ranges of heating capacities are obtained by changing the arrangement of the extended heating surface of the Herman Nelson Wedge Core Radiator.

Description and Application

No. 130, 210 and 360 Series Voluvents—These consist of two horizontal groups of Herman Nelson Wedge Core Radiators arranged for alternate control, two double inlet multiblade type fans, a variable speed Her-Nel-Co Motor with a double extended shaft, and a heavy gauge sheet steel cabinet.

Air from outside the building or recirculated air is drawn into the fans and blown through the radiator, where it is warmed. This warmed air is then discharged into the room.

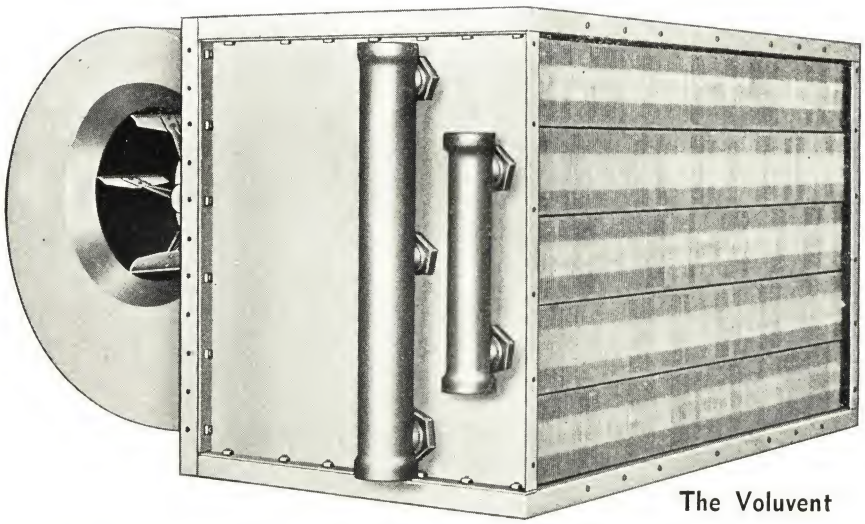
The Voluvent is designed to be installed to discharge directly into the room to be ventilated with only the radiator or a grille showing, or it can be arranged to discharge into a duct and then into the room through a grille. It can also be installed directly in the room wherever its appearance will not be objectionable.

No. 130R and 130SD Series Voluvents—These have been developed especially for use in small basement rooms where it is not possible to use floor mounted Univents. It should be clearly understood that the best results from the standpoint of thorough diffusion, uniform heating, proper air motion and freedom from draughts are obtained by using the standard Univent with its very effective high velocity vertical jet. For this reason standard Univents mounted on or near the floor should be used wherever possible. However, there are some few cases where such applications are not possible because of structural difficulties. In such cases a compromise arrangement becomes necessary and it is to provide for these cases that the No. 130R and 130SD Series Voluvents were developed.

No. 130R Series Voluvent—This Voluvent consists of a bank of three Herman Nelson Wedge Core Radiators arranged to be controlled in two groups, two double inlet multiblade fans, a variable speed Her-Nel-Co Motor, a heavy sheet steel cabinet in which the filters (if used) are mounted, outdoor air and recirculating dampers linked together, a recirculating grille and a large access door, all as illustrated on page 67.

No. 130SD Series Voluvent—This Voluvent is identical with 130R Series except that the recirculating dampers are bolted closed.

Both the No. 130R and No. 130SD Series are arranged to be hung from the ceiling.



The Voluvent

Radiator

The Herman Nelson Wedge Core Radiator used in the Voluvent is an all aluminum, light weight, compact, extended surface radiator, consisting of a multiplicity of smooth aluminum plates or fins securely mounted on a one-piece cast aluminum alloy core (see pages 2 and 3). The radiators are laid horizontally and arranged to be controlled in two alternate groups, each group having its own supply and return header. Control of the temperature of the discharge air is obtained by throttling, in turn, the larger and smaller groups of sections. This method of control eliminates all noisy, bulky, by-pass dampers and is much more effective than when a large by-pass is used.

Motors

The Her-Nel-Co Motors used in the Voluvent are of the same adjustable speed type used in the Her-Nel-Co Magnavent (see page 32). Speed variation which varies the air delivery of the Voluvent, is obtained by means of the Her-Nel-Co Speed Controller.

Intakes and Filters

Voluvent intakes and filters as shown on page 70 are similar to those furnished with Her-Nel-Co Magnavent.

Voluvent Engineering Data

The Voluvent is rated in cubic feet of air per minute as determined by the A.S.H. and V.E. standard anemometer tests and are based on a normal amount of resistance in ducts, etc. As required by these standards the velocity is determined by holding the anemometer two inches away from the face of the radiator with the grille (if used) removed. The c.f.m. is then determined by multiplying this velocity by the full area of the radiator.

The Voluvent may be used for *"split"* ventilating systems, *"modified"* systems, straight *"blast"* systems, or strictly for heating purposes with all the air recirculated.

Each size is furnished with radiators of different fin spacings, providing a wide range of heating capacities.

The Capacity Tables given on page 66 gives the total capacity, the heating capacity and the final temperature for various air deliveries for all fin spacings. The total capacities should be used in determining the boiler size, pipe sizes, trap sizes, etc. The heating capacities determine the amount of heat available for taking care of the heat losses of the room above 70 degrees.

The selection of the Voluvent is a matter of engineering and depends entirely on the way it is to be used and on the type of system that is to be employed. After the required air capacity and the excess heating capacity have been determined, it is a simple matter to refer to the Capacity tables to select the proper Voluvent to fit these conditions.

The No. 130, 210 and 360 Series Voluvents should be located where the duct work will be as short as possible, where provision can be made for recirculation from the floor line, where the motors and filters (if used) will be accessible and as low as possible.

For quiet operation canvas connections should be installed between the Voluvent cabinet and any duct work that may be attached to it.

For dimensions and typical applications, see pages 67 and 68.

Outside air ducts and recirculating ducts and registers should have not less than 1 sq. ft. of free area for each 500 c.f.m. of Voluvent capacity. Thus any duct for the No. 210 series should have not less than 6 sq. ft. cross-sectional area and not less than 10 sq. ft. for the No. 360 series.

All dampers should be specified to be furnished and installed by the ventilating contractor.

If desired, the air may be discharged through grilles into the room. These grilles should be specified to be furnished and installed by others. Care should be taken to be sure that these grilles are installed at least ½ inch away from the face of the radiator, that they are full size of the radiator and that they provide at least 72% free area.

All room vents should have back draft dampers and should be provided with some means of being shut off when the system is not in operation.

These Voluvents are medium velocity units and, therefore, should be located as close to the floor as possible. This is particularly essential in all cases where they are to take care of any heat loss and where they are to recirculate for quick heating. The recirculating and outside air connections should be made as short and as free from turns as possible.

The No. 130R Series and 130SD Series Voluvents should be located on the ceiling as close to the outside wall as possible. It is recommended that they be arranged to discharge across the short dimension of the room whenever possible.

VOLUVENT CAPACITY TABLES

Serial No. and Code Word	Cu. Ft. of Air Per Min.	Capacities Given in Equivalent Square Feet of Direct Steam Radiation for Various Entering Air Temperatures.																											
		−20°			−10°			0°			+10°			+20°			+30°			+50°			+60°			+70°		
		Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.	Tot. Cap.	Htg. Cap.	F. T.
130 SERIES																													
131 (Vague)	1210	509	**18**	73	476	**44**	78	454	**70**	83	426	**96**	88	394	**122**	92	366	**149**	97	312	**201**	107	284	**232**	112	254	**254**	116
131R (Varix)	1375	566	**5**	71	535	**35**	76	497	**65**	80	466	**95**	85	441	**130**	91	410	**159**	96	342	**218**	105	311	**249**	110	278	**278**	115
131SD (Veldt)	1540	598	**–**	66	570	**17**	72	535	**50**	77	501	**84**	82	473	**123**	88	432	**156**	92	368	**229**	103	334	**262**	108	296	**296**	112
132 (Valet)	1210	585	**92**	87	552	**114**	91	525	**140**	96	493	**162**	100	460	**184**	104	426	**210**	108	362	**253**	116	334	**280**	121	302	**302**	125
132R (Vatic)	1375	627	**70**	81	591	**94**	85	560	**125**	90	522	**149**	94	491	**179**	99	460	**209**	104	385	**264**	112	354	**293**	117	318	**318**	121
132SD (Veium)	1540	668	**45**	76	626	**72**	80	591	**106**	85	556	**139**	90	522	**173**	95	486	**206**	100	410	**273**	109	375	**306**	114	340	**340**	119
133 (Valor)	1210	674	**183**	103	640	**201**	107	608	**223**	111	569	**240**	114	536	**262**	118	498	**289**	121	427	**320**	128	394	**337**	132	369	**369**	136
133R (Veery)	1375	720	**164**	96	684	**189**	100	646	**214**	104	610	**239**	108	572	**263**	112	535	**283**	116	460	**333**	124	423	**358**	128	382	**382**	132
133SD (Venal)	1540	774	**145**	91	730	**173**	95	688	**201**	99	647	**228**	103	605	**256**	107	570	**289**	112	487	**345**	120	445	**374**	124	402	**402**	128
210 SERIES																													
211 (Vagas)	1800	845	**114**	84	805	**155**	89	773	**203**	95	708	**220**	97	668	**260**	102	610	**285**	105	505	**342**	112	456	**374**	116	407	**407**	120
	2400	1000	**22**	72	934	**65**	76	890	**130**	82	813	**163**	85	738	**195**	88	684	**250**	93	575	**358**	103	509	**400**	107	521	**521**	118
	3000	1194	**–**	68	1086	**0**	70	1004	**53**	74	935	**122**	79	842	**163**	82	773	**230**	87	638	**366**	97	569	**434**	102	516	**516**	108
212 (Valid)	1800	920	**187**	93	863	**212**	96	822	**252**	101	764	**276**	104	707	**301**	107	648	**326**	110	537	**374**	116	488	**407**	120	448	**448**	125
	2400	1085	**109**	80	1062	**195**	88	1020	**260**	94	923	**271**	95	847	**304**	98	771	**336**	101	606	**390**	106	564	**456**	112	500	**500**	116
	3000	1274	**54**	74	1233	**149**	81	1167	**218**	86	1086	**271**	90	990	**312**	93	922	**380**	98	732	**461**	104	678	**543**	110	596	**596**	114
213 (Varus)	1800	1010	**277**	104	945	**292**	106	895	**325**	110	845	**358**	114	790	**382**	117	740	**415**	121	610	**447**	125	554	**472**	128	504	**504**	132
	2400	1194	**218**	90	1140	**271**	95	1063	**304**	98	998	**347**	102	922	**380**	105	868	**434**	110	715	**498**	116	640	**532**	119	575	**575**	123
	3000	1330	**108**	78	1260	**176**	83	1178	**230**	87	1112	**298**	92	1030	**352**	96	948	**407**	100	786	**516**	108	705	**570**	112	633	**633**	117
360 SERIES																													
361 (Vaunt)	3500	1580	**158**	80	1486	**221**	84	1360	**253**	86	1300	**348**	92	1171	**380**	94	1093	**460**	99	902	**586**	107	807	**650**	111	728	**728**	116
	4000	1736	**108**	76	1626	**181**	80	1483	**217**	82	1410	**326**	88	1268	**362**	90	1191	**470**	96	958	**597**	103	813	**632**	105	795	**795**	114
	4500	1850	**20**	71	1750	**122**	76	1584	**163**	78	1525	**305**	85	1362	**346**	87	1260	**448**	92	1037	**631**	101	895	**692**	104	814	**814**	110
	5000	1990	**–**	68	1850	**45**	72	1696	**113**	75	1627	**271**	82	1446	**316**	84	1356	**452**	90	1107	**655**	99	950	**724**	102	882	**882**	109
362 (Verse)	3500	1740	**316**	90	1615	**348**	92	1520	**411**	96	1391	**443**	98	1296	**506**	102	1186	**554**	105	981	**665**	112	918	**760**	118	824	**824**	122
	4000	1880	**253**	84	1755	**307**	87	1644	**380**	91	1482	**398**	92	1411	**506**	98	1284	**561**	101	1067	**705**	109	976	**795**	114	886	**886**	119
	4500	1971	**142**	77	1850	**224**	81	1730	**306**	85	1567	**346**	87	1464	**448**	92	1342	**529**	96	1097	**692**	104	1017	**813**	110	916	**916**	115
	5000	2055	**23**	71	1920	**113**	75	1808	**226**	80	1650	**294**	83	1536	**407**	88	1400	**498**	92	1153	**700**	101	1039	**814**	106	950	**950**	112
363 (Vista)	3500	1850	**427**	97	1740	**474**	100	1646	**538**	104	1550	**601**	108	1440	**650**	111	1346	**711**	115	1138	**822**	122	1044	**886**	126	950	**950**	130
	4000	1970	**344**	89	1880	**434**	94	1770	**506**	98	1662	**580**	102	1535	**633**	105	1448	**723**	110	1212	**850**	117	1102	**921**	121	1012	**1012**	126
	4500	2095	**264**	83	1990	**366**	88	1830	**406**	90	1750	**528**	96	1627	**610**	100	1527	**711**	105	1280	**873**	113	1158	**955**	117	1036	**1036**	121
	5000	2215	**181**	78	2080	**271**	82	1962	**384**	87	1832	**475**	91	1716	**587**	96	1582	**678**	100	1356	**903**	110	1220	**994**	114	1084	**1084**	118

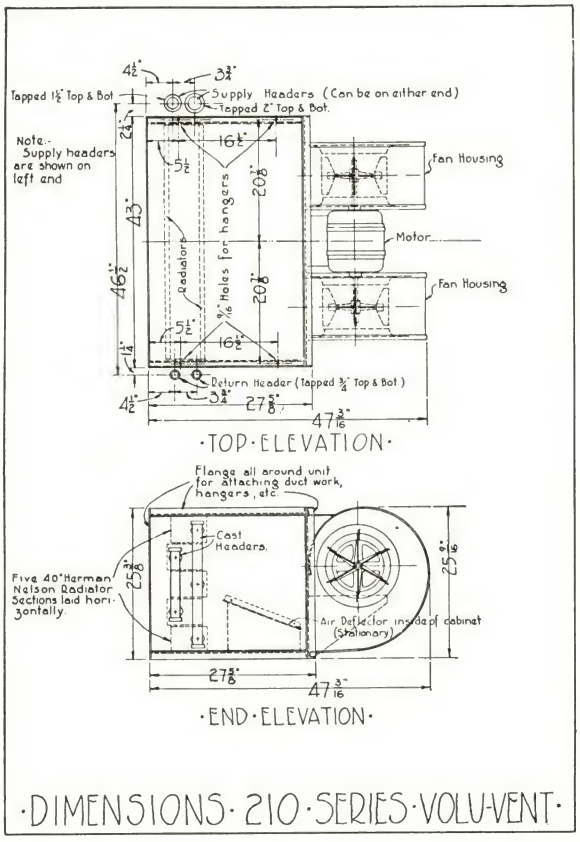
Notes

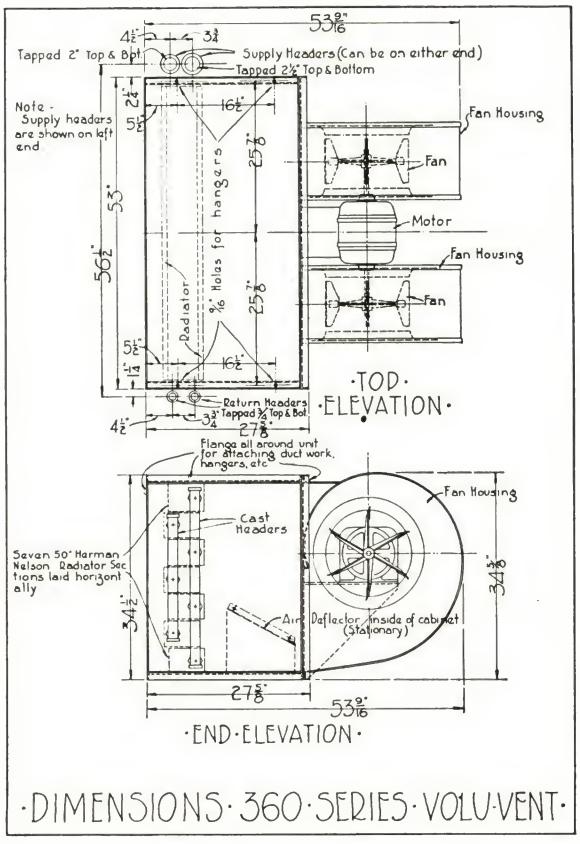
All heating capacities are based on a steam temperature in the radiator of 218° F. All air velocities are based on A.S.H. and V.E. standard anemometer measurement with the anemometer held 2 in. away from face of radiator with grille (if used) removed. All air capacities are based on this velocity and the full area of the radiator as stipulated in the A.S.H. and V.E. code.

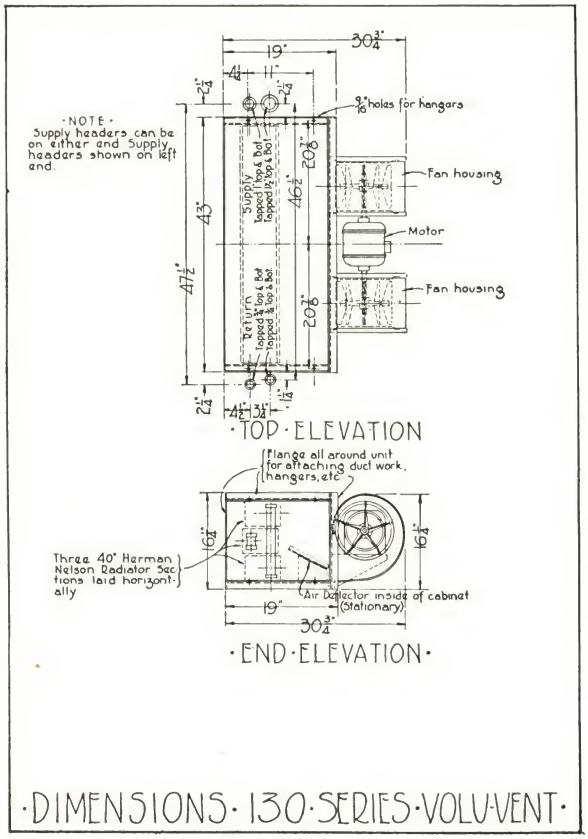
Total capacity equals total condensing capacity of unit.

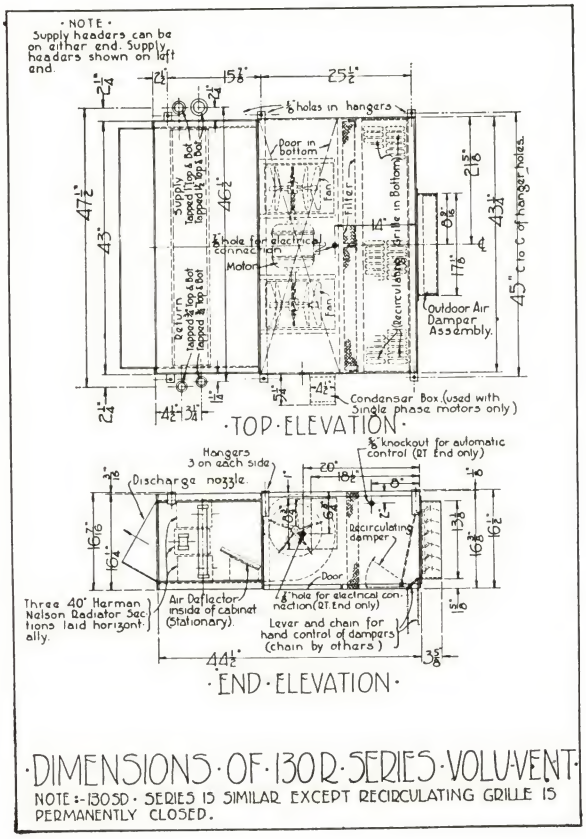
Heating capacity equals surplus capacity available for heating when room temperature is 70° F.

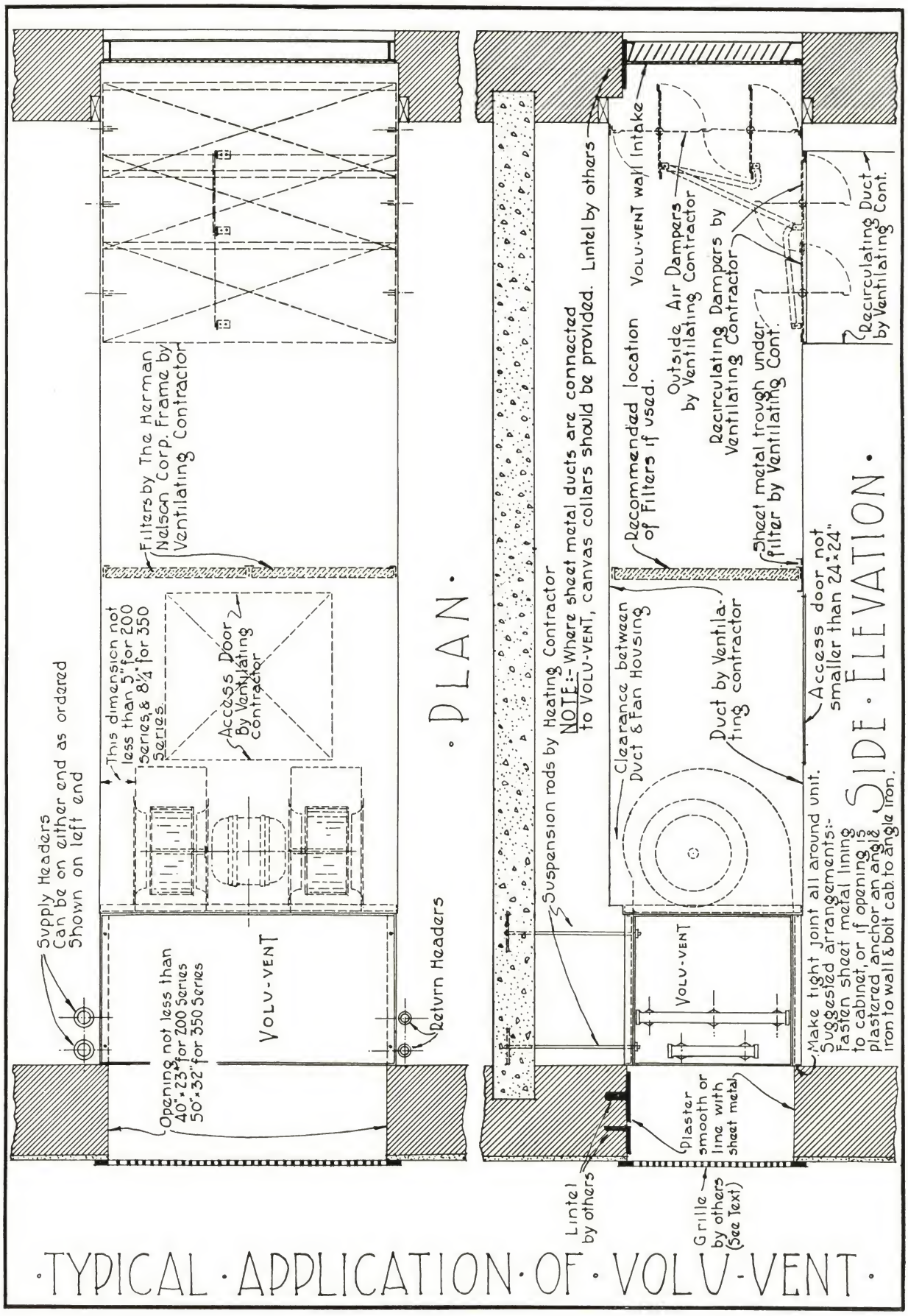
Where 25 cycle current is used the maximum capacity is 1375 c.f.m. for the 130, 130R and 130SD series, 2400 c.f.m. for the 210 series and 4500 c.f.m. for the 360 series.

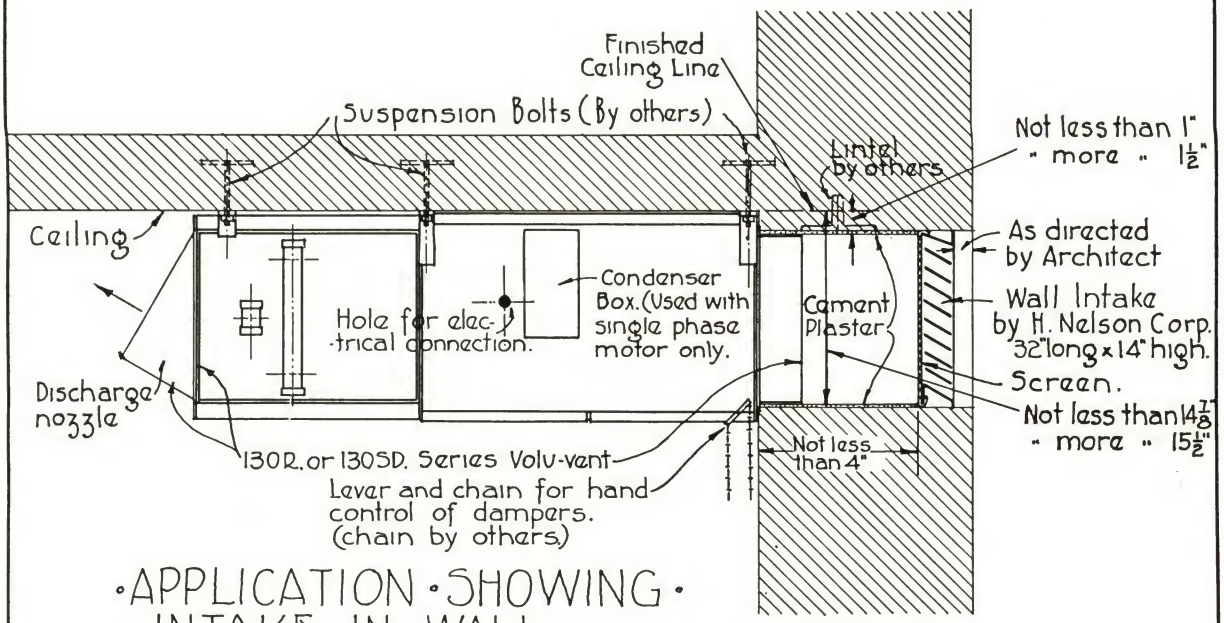

Tapped 1½" Top & Bot
Supply Headers (Can be on either end)
Tapped 2" Top & Bot.
Note.- Supply headers are shown on left end
Fan Housing
Motor
Fan Housing
Radiator
Holes for hangers
Return Header (Tapped ¾" Top & Bot)
·TOP·ELEVATION·
Flange all around unit for attaching duct work, hangers, etc.
Cast Headers.
Five 40" Herman Nelson Radiator Sections laid horizontally.
Air Deflector inside of cabinet (Stationary)
·END·ELEVATION·
·DIMENSIONS· 210 ·SERIES·VOLU-VENT·


Tapped 2" Top & Bot
Supply Headers (Can be on either end)
Tapped 2½" Top & Bottom
Note - Supply headers are shown on left end
Fan Housing
Fan
Motor
Fan Housing
Fan
Radiator
Holes for hangers
Return Headers Tapped ¾" Top & Bot
·TOP· ·ELEVATION·
Flange all around unit for attaching duct work, hangers, etc.
Cast Headers
Fan Housing
Seven 50" Herman Nelson Radiator Sections laid horizontally
Air Deflector inside of cabinet (Stationary)
·END·ELEVATION·
·DIMENSIONS· 360 ·SERIES· VOLU·VENT·

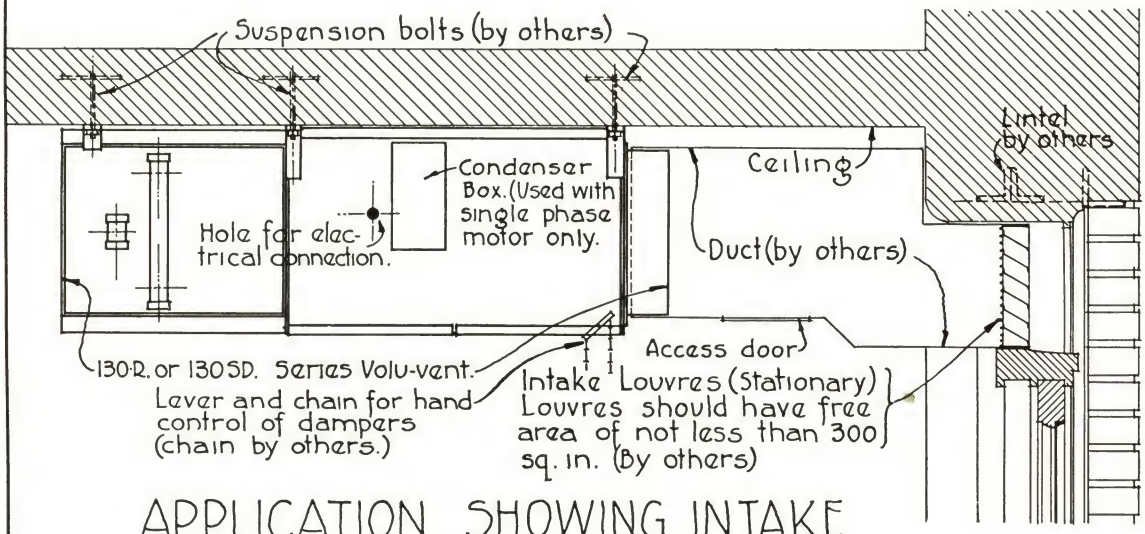

·NOTE· Supply headers can be on either end. Supply headers shown on left end.
holes for hangers
Fan housing
Motor
Fan housing
Supply Top & Bot
Return Top & Bot
·TOP· ELEVATION
Flange all around unit for attaching duct work, hangers, etc.
Three 40" Herman Nelson Radiator Sections laid horizontally
Air Deflector inside of cabinet (Stationary)
·END·ELEVATION·
·DIMENSIONS· 130 ·SERIES·VOLU·VENT·


·NOTE· Supply headers can be on either end. Supply headers shown on left end.
holes in hangers
Door in bottom
Fan
Filter
Motor
hole for electrical connection
Recirculating Grille in Bottom
Outdoor Air Damper Assembly.
C to C of hanger holes.
Condensor Box (used with single phase motors only)
·TOP· ELEVATION·
Hangers 3 on each side
knockout for automatic control (RT End only)
Discharge nozzle.
Recirculating damper
Door
hole for electrical connection (RT End only)
Three 40" Herman Nelson Radiator Sections laid horizontally.
Air Deflector inside of cabinet (Stationary).
Lever and chain for hand control of dampers (chain by others)
·END· ELEVATION·
·DIMENSIONS· OF· 130 R· SERIES· VOLU·VENT·
NOTE:- 130SD· SERIES IS SIMILAR EXCEPT RECIRCULATING GRILLE IS PERMANENTLY CLOSED.


PLAN
Supply Headers Can be on either end as ordered Shown on left end
This dimension not less than 5" for 200 Series, & 8¼" for 350 Series
Access Door By Ventilating Contractor
Filters by The Herman Nelson Corp. Frame by Ventilating Contractor
VOLU-VENT
Return Headers
Opening not less than 40"×23" for 200 Series 50"×32" for 350 Series
SIDE ELEVATION
Suspension rods by Heating Contractor
NOTE:- Where sheet metal ducts are connected to VOLU-VENT, canvas collars should be provided.
Lintel by others
Recommended location of Filters if used.
VOLU-VENT wall Intake
Outside Air Dampers by Ventilating Contractor
Recirculating Dampers by Ventilating Contractor
Sheet metal trough under filter by Ventilating Cont.
Recirculating Duct by Ventilating Cont.
Clearance between Duct & Fan Housing
Duct by Ventilating contractor
Access door not smaller than 24"×24"
VOLU-VENT
Make tight joint all around unit. Suggested arrangements:- Fasten sheet metal lining to cabinet, or if opening is plastered, anchor an angle iron to wall & bolt cab to angle iron.
Plaster smooth or line with sheet metal
Lintel by others
Grille by others (See Text)
TYPICAL APPLICATION OF VOLU-VENT



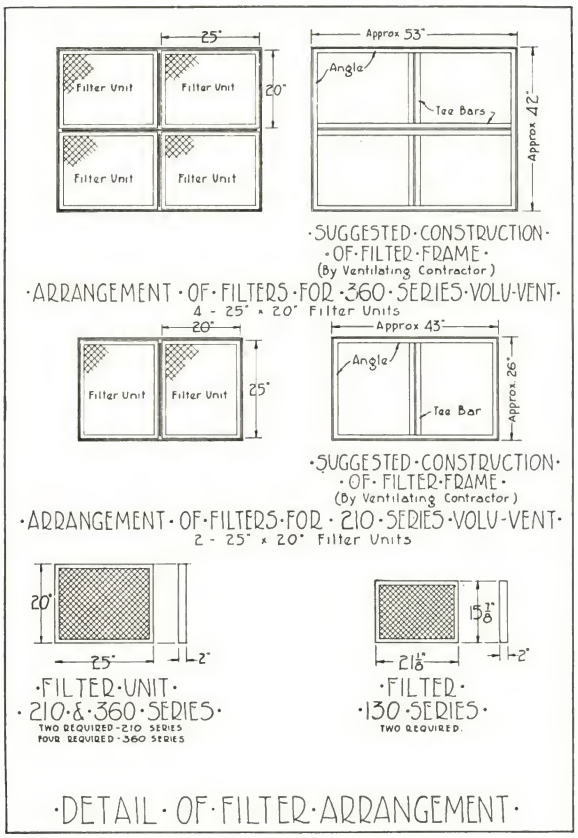
APPLICATION SHOWING INTAKE IN WALL

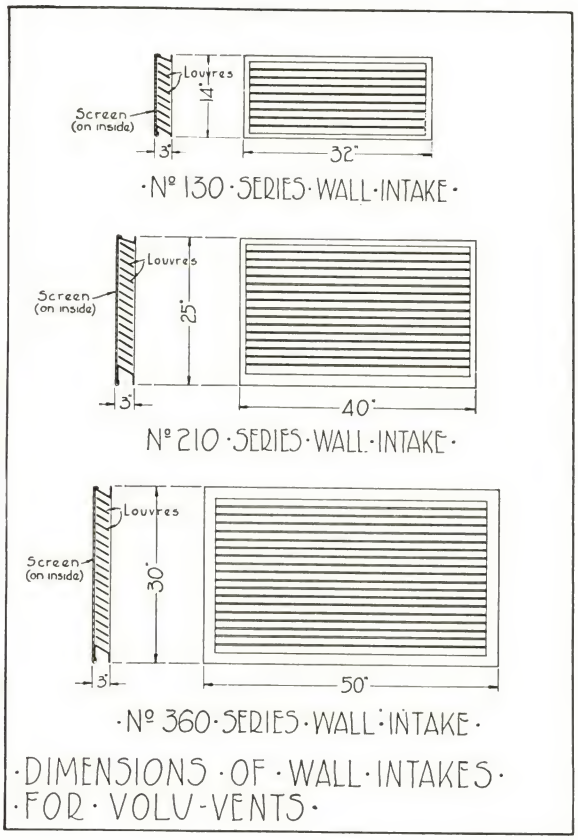


APPLICATION SHOWING INTAKE THRU WINDOW.

Note - For further details of Volu-vent 130R & 130SD Series see dimension sheet.

APPLICATIONS OF 130R & 130SD SERIES VOLU-VENTS





Temperature Control with the Voluvent

Automatic Control

The Voluvent has been designed with double supply and return headers in order to facilitate temperature control.

This method of splitting up the heater into alternate sections under separate control greatly facilitates the application of automatic temperature control without the use of large bypass and radiator shut-off dampers.

Heating and Ventilation—When the Voluvent is to be used to do some heating, one method of control is to install diaphragm valves on each supply header with a room thermostat arranged to throttle the smaller group until the valve is closed and then to throttle the larger group as required. It is further recommended that a duct thermostat be located in the air discharge of the Voluvent at the return end of the radiator and set to prevent the air from dropping below a predetermined temperature. In this way the possibility of drafts is eliminated.

Heating Only—Where the Voluvent is used for heating only it will be found most satisfactory to control both steam supply valves by the use of a room and duct thermostat as described above, with the fans running constantly to maintain diffusion.

In all cases it is recommended that the larger group be throttled last because this leaves the lower section hot as long as possible, thus thoroughly mixing the heated and unheated air. It is to be carefully noted that the unique arrangement of alternated control results in the thorough mixing of the thin streams of heated and unheated air when they are discharged into the room.

It is recommended that the fresh air, recirculating and vent dampers be all operated by air motors, in conjunction with the temperature control system and arranged to be controlled from the fan control point. The fresh air and vent dampers should be normally closed.

Manual Control

Where manual or hand control is used, separate globe valves should be provided for each header. They should be laid on their side and located so they may be readily controlled. They should be arranged for convenient operation by the use of chain controls, extended handles, etc.

Wiring Data

Wiring diagrams showing the various methods of connecting single-phase and three-phase Her-Nel-Co motors are shown below.

Due to the fact that they are easier and less expensive to protect, control and install, single-phase Voluvent Her-Nel-Co motors are recommended in preference to three-phase motors.

However, in many cases it is only possible to obtain three-phase service. In these cases it is perfectly practical to use single-phase Her-Nel-Co motors and to connect each motor with its controller across any two wires of the three-phase service as shown below. This method permits the user to enjoy the advantages of the single-phase motor and at the same time permits him to use three-phase service.

Where single-phase motors are used on three-phase service they should be balanced between the phases as evenly as possible with one controller for each phase.

Due to the fact that the starting current is quite low, single-phase and three-phase Voluvent Her-Nel-Co motors can be protected by the use of fuses having a capacity of two and one-half times the running current. A switch should be provided before each controller. Fuses should be installed where required by local ordinances.

It is recommended that thermal cut-outs be used in all cases to protect the motors and controllers, particularly in the case of three-phase equipment. Only one thermal cut-out is required for each single-phase motor, while two are required for each three-phase motor. These cut-outs are so designed that the momentary rush of current that occurs while starting will not blow them but they will be blown by a smaller amount of current that continues long enough to damage the motor. In this way thermal cut-outs provide adequate protection under all conditions.

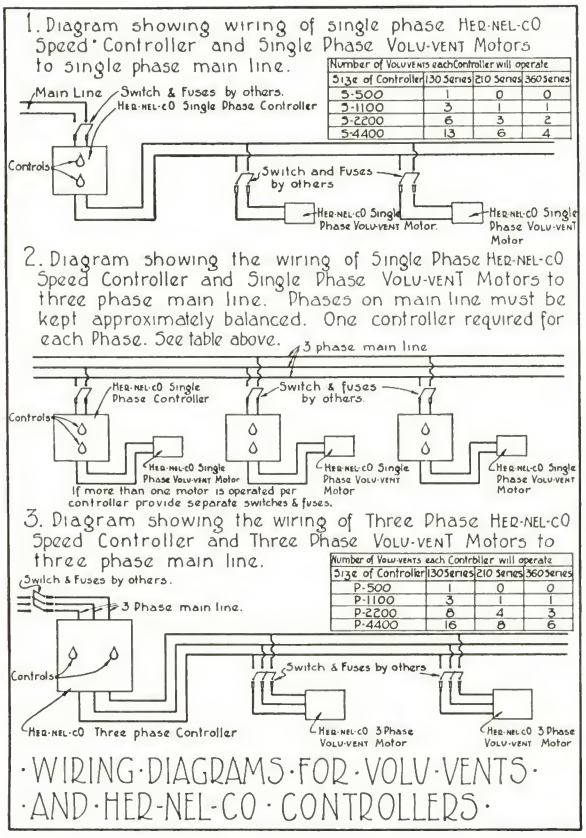
Standard fuses having a rating two and one-half times the running current of the motor should be used in each of the two or three lines before the thermal cut-outs to protect them against short circuits.

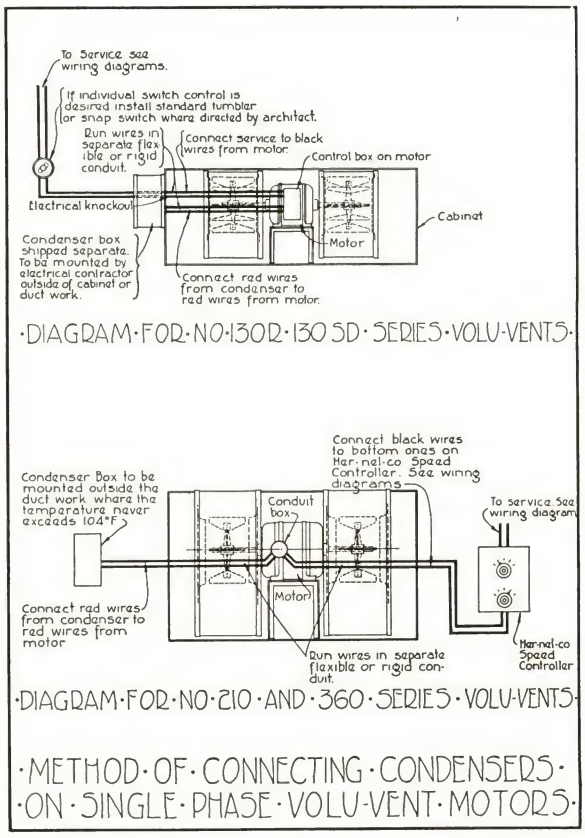
No standard or Her-Nel-Co motors should be used where the temperature exceeds 40° C. or 104° F. when the motors are running or idle.

MOTOR DATA

Voluvent series	Phase	Cycles	Amperes per lead		
			110 V.	220 V.	440 V.
130	1	60	3.0	1.5	
130R	1	50	2.5	1.25	
130SD	1	25	3.0	1.5	
	3	60		.75	
	3	50		.65	
	3	25		.75	
	D-c.		2.4	1.2	
210	1	60	6.0	3.0	
	1	50	5.0	2.5	
	1	25	6.0	3.0	
	3	60		1.5	.75
	3	50		1.25	.65
	3	25		1.5	.75
	D-c.		4.8	2.4	
360	1	60	8.4	4.2	
	1	50	7.0	3.5	
	1	25	8.4	4.2	
	3	60		2.1	1.1
	3	50		1.8	.9
	3	25		2.1	1.1
	D-c.		7.0	3.5	

Note: The above data will be found useful in determining wire sizes, etc.





Piping Suggestions

Typical piping connections for various types of systems are shown on this page.

In general, separate automatic control diaphragm valves or hand controlled globe valves should be provided for each header. All hand or diaphragm valves of the globe type should be laid on their side to avoid forming pockets in the lines. Care should be taken to carefully drain the risers after each valve (when supply is from below) so that pounding will not occur when the valves are throttled.

The face of the radiator should always be vertical, because if it is tilted either forward or backward, one group of radiators will not drain properly. The supply end of the radiator should always be on the same level as the return end or higher in order to insure proper drainage of the sections.

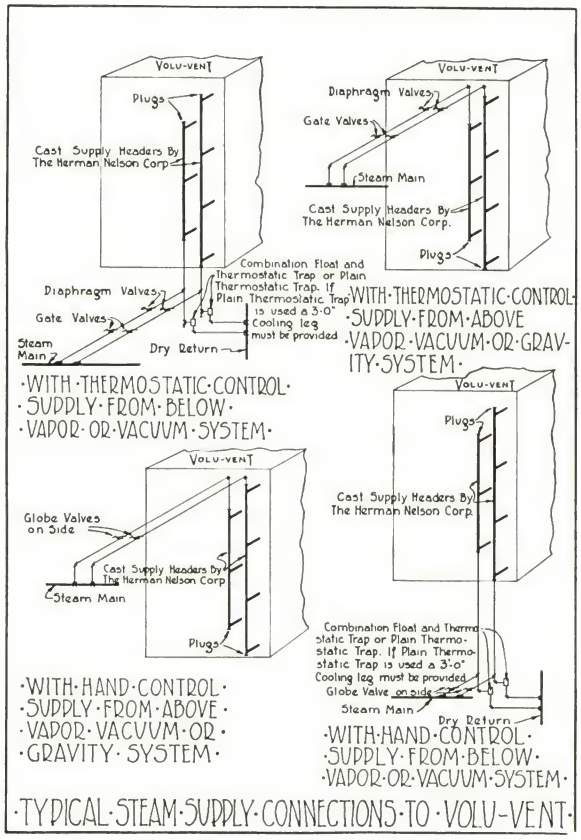
All boiler, piping, valve and trap sizes should be determined from the total heating capacity of the Voluvent when operating under the stipulated conditions.

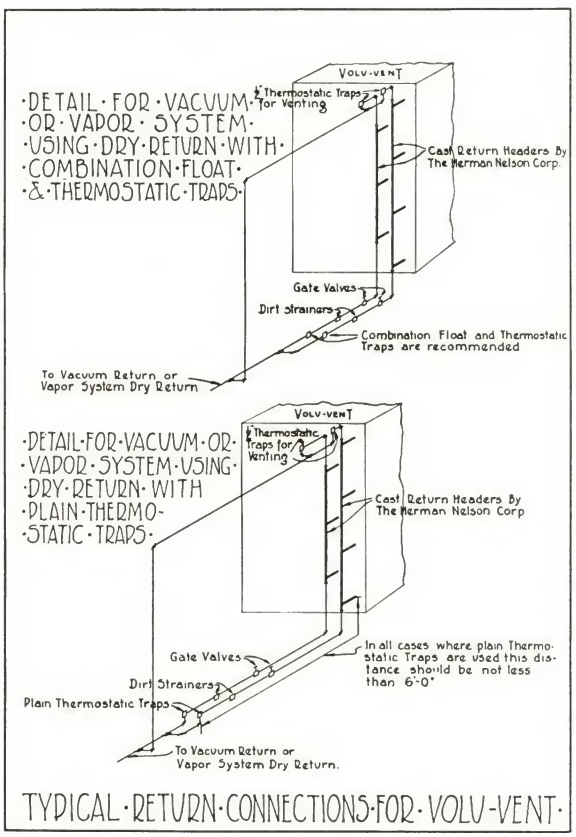
In general, it is recommended that in the case of vapor and vacuum systems where traps are used, that combination float and thermostatic traps be used to drain each return header independently and that the top of each return header be vented through a thermostatic trap.

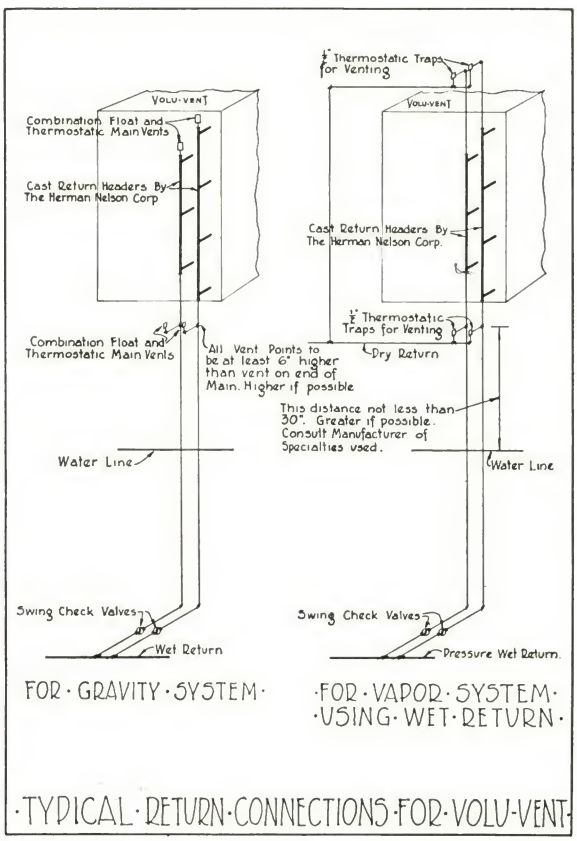
If thermostatic traps are used to drain the heater, cooling legs, at least 3 ft. long, should be provided in front of them to provide room for the water to stand while cooling to a temperature low enough to open the traps. This precaution is very important.

For gravity systems the Voluvent should have two pipe connections. All return headers should be drained from the bottom and should be vented from the top and bottom by automatic vents of the combination float and thermostatic type.

In general, in all steam systems the water of condensation should be drained from the bottom of each return header and the air should be vented from the top and bottom of each return header, except that in the case of the 130, 130R and 130SD series the upper vent may be omitted from the single center section.







SUGGESTED SPECIFICATIONS

for

HER-NEL-CO VENTILATOR
HER-NEL-CO MAGNAVENT
HERMAN NELSON UNIVENT
HERMAN NELSON VOLUVENT

It is the intention of these specifications to provide for a complete installation of the Her-Nel-Co System of Ventilation as manufactured by THE HERMAN NELSON CORPORATION, Moline, Illinois.

Alternate Proposals

If the contractor desires to bid on any other type of unit system or make of equipment, he shall submit a base bid on the Her-Nel-Co System as specified, and name in his bid the amount to be deducted or added in case a substitute system or equipment is accepted. He shall furnish with such alternate proposal complete literature and data to enable the architect and owner to determine the comparative merit of the proposed substitution, including a complete description of the equipment and its operation, fuel costs, etc. He shall specifically call attention to any changes in the building construction, sheet metal work, temperature control equipment, boiler plant, chimney size, etc., that may be required by the proposed substitution. The owner reserves the right to reject any and all alternate bids and to consider quality and merit as well as price. Unless the proposed substitute is selected in awarding the contract, the Her-Nel-Co System, as manufactured by THE HERMAN NELSON CORPORATION, shall be furnished and installed in accordance with the plans, specifications and manufacturer's literature. No substitutions will be permitted after the contract is awarded.

HER-NEL-CO VENTILATORS

Ventilators

Contractor shall furnish and install all Her-Nel-Co Ventilators of sizes, capacities and models shown on plans or accompanying schedule. All Her-Nel-Co Ventilators shall be carefully placed in locations shown and set in accordance with manufacturer's recommendations. Necessary steam supply and return connections with all valves, etc., shall be properly made by contractor who shall be held responsible for the care of all Her-Nel-Co Ventilators until the work is completed and accepted by the architect. Her-Nel-Co Ventilators shall be kept in clean, dry storage until ready for installation, when they shall be set level and firmly attached to the walls in an approved manner. No Her-Nel-Co Ventilator will be accepted on which the finish or any other part has been damaged in any way through improper handling, insufficient protection or indifferent workmanship.

Motors and Switches

All Her-Nel-Co Ventilators shall be equipped with Her-Nel-Co adjustable speed motors especially designed for this service and to operate on [110] [220] volt, [direct] [alternating] [single] [three] phase, [25] [50] [60] cycle current.

For Hand Control—All cabinets shall be equipped with switches incorporated in the hand control equipment.

For Automatic Temperature Control—All cabinets shall be equipped with key (or flush) tumbler switches.

Air Intakes

Where Model "J" Her-Nel-Co Ventilators are shown and specified, standard wall intakes of the horizontal (or vertical) type, finished with brown lacquer, as shown in manufacturer's catalogue shall be provided by the heating contractor and delivered to the masonry contractor with complete instructions for installation. All lintels will be furnished by others. Where Model "K" Her-Nel-Co Ventilators are shown or specified, necessary connections and screened intakes shall be furnished and installed by the heating contractor all as per manufacturer's literature. The heating contractor shall co-operate with and properly instruct carpenter or other contractors to insure the proper setting and connection of these intakes through the lower window sash or sill.

All intakes shall be painted by others, as directed.

Cabinets, Grilles, etc.

All cabinets shall be built of furniture steel neatly finished in "Morocco" enamel. Outlet grilles shall be of solid cast non-corrosive metal, finished in antique bronze.

Filters

All Her-Nel-Co Ventilators shall be provided with filters of the adhesive oiled type as furnished by the manufacturers and shown in their catalogue. These shall be installed within the Her-Nel-Co Ventilator in such a manner that they may be instantly removed or replaced without the use of tools of any kind.

Humidifiers (Optional)

All Her-Nel-Co Ventilators shall be equipped with steam jet, nozzle type humidifiers with hand-control valves, as shown in the manufacturer's literature.

Her-Nel-Co Ventilator Specifications (Continued)

Type of Control

For Hand Control—All Her-Nel-Co Ventilators shall be equipped for hand control. Control equipment shall be so arranged that the Her-Nel-Co Ventilator radiator and dampers will be controlled in the proper order by turning the control knob. The motor shall be started and stopped by means of a snap switch arranged to be operated by the same control knob.

The radiator valve, dampers, and operating mechanism shall all be furnished as integral parts of the Her-Nel-Co Ventilator and shall be arranged for use on a ..... system.

For Automatic Temperature Control—All Her-Nel-Co Ventilators shall be arranged for automatic control in conjunction with the ..... system of temperature regulation. The diaphragm valve for use on the Her-Nel-Co Ventilator radiator shall be furnished by the temperature control contractor and installed ready for air piping by the heating contractor.

The damper motors for operating the dampers shall be furnished by the temperature control contractor to THE HERMAN NELSON CORPORATION who will install them in the cabinets at the factory.

All adjustment of springs, thermostats, etc., shall be made on the job by the temperature control manufacturer.

Air Deliveries

All air velocities shall be determined by the A.S.H.& V.E. standard anemometer method, with the anemometer held 2 in. above the face of the discharge grille. The air delivery shall be determined by multiplying the velocity determined in this way by the gross area of the discharge grille.

HER-NEL-CO MAGNAVENTS

Magnavents

Contractor shall furnish and install all Magnavents of sizes and capacities shown on plans or accompanying schedule, complete with adjustable deflectors, duct work, etc. All Magnavents shall be carefully placed in locations shown and set in accordance with manufacturer's instructions. Groups of Herman Nelson Wedge Core Radiators as called for on the plans shall be included as part of the Magnavent equipment. Necessary steam supply and return connections with all valves, etc., shall be properly made by contractor and he shall be held responsible for the care of all Magnavents until the work is completed and accepted by the architect. Magnavents shall be kept in clean, dry storage until ready for installation.

All deflectors, grilles, duct work, access doors, etc., shall be furnished and installed by this contractor.

Motors and Speed Controllers

All Magnavents shall be equipped with Her-Nel-Co adjustable speed motors especially designed for this service and to operate on [110] [220] volt, [direct] [alternating] [single] [three] phase, [25] [50] [60] cycle current.

Her-Nel-Co Speed Controllers for controlling the motor speed shall be furnished for all Magnavents.

Air Intakes

Where Magnavents are shown or specified, standard wall intakes, finished with brown lacquer, as shown in manufacturer's literature shall be provided by the heating contractor and delivered to the masonry contractor with complete instructions for installation.

Cabinet Finish

All cabinets shall be built of furniture steel neatly finished in brown lacquer.

Filters

All Magnavents shall be provided with filters of the adhesive oiled type as furnished by the manufacturers and as shown in their literature. These shall be installed within duct work before the Magnavents in such a manner that they may be removed or replaced without the use of tools of any kind.

Type of Control

For Hand Control—All Her-Nel-Co Magnavents shall be equipped for hand control. Hand operated control dampers shall be provided in the outdoor air and room air ducts and so arranged that the amount of heating and cooling performed by the Magnavent may be controlled by chain operation of these dampers.

All dampers and control mechanism, including the necessary chain, shall be furnished and installed by this contractor. Chain markers and instruction plate shall be furnished by THE HERMAN NELSON CORPORATION.

The valves on the Herman Nelson Wedge Core Radiators shall be of the gate type, so located that they will be readily accessible.

For Automatic Temperature Control—All Magnavents shall be arranged for automatic control by providing mixing dampers, furnished and installed by the temperature control contractor, in the outside air and room air ducts and a diaphragm valve on the Herman Nelson Wedge Core Radiators. The diaphragm valve on the Wedge Core Radiators shall be furnished by the temperature control contractor and installed ready for air piping by the heating contractor.

All adjustments of springs, thermostats, etc., shall be made on the job by the temperature control manufacturer.

ELECTRIC WIRING SPECIFICATIONS

The electrical contractor shall furnish and install a complete system of wiring for the operation of all Her-Nel-Co Ventilators and Magnavents as shown on plans, in accordance with the manufacturer's literature and other printed instructions.

All wiring shall be done in full accordance with the rules and regulations of the National Board of Fire Underwriters and such state, municipal or local Power Company rules and regulations as may be in force. The general character of the wiring shall be the same as for the lighting system, so far as materials are concerned, providing it meets the requirements above stated. The sizes of wire used shall be such that the greatest drop in voltage, when all motors are running, shall not exceed three volts. The current requirements for the various Her-Nel-Co Ventilators and Magnavents may be obtained from the manufacturer's literature.

Electrical contractor shall leave a wall outlet for each Her-Nel-Co Ventilator close to the floor and at the right hand end of the cabinet as one stands facing it and shall also confer with the heating and ventilating contractor concerning the exact location of these outlets.

Wiring connections between wall outlets and cabinets shall be made in flexible, flat or rigid conduits, and the work shall be done in a neat, workmanlike manner.

No additional switches are required with Her-Nel-Co Ventilators.

Electrical contractor shall mount and wire all Her-Nel-Co Speed Controllers used to control the Magnavent motors. Each Her-Nel-Co Speed Controller and each one of any group of motors controlled by one Controller shall be equipped with switches and fuses furnished and installed by this contractor.

AUTOMATIC TEMPERATURE CONTROL SPECIFICATIONS

(To be added to the heating and ventilating specification when automatic temperature control is desired.)

All rooms in which Her-Nel-Co Ventilators or Magnavents are shown shall be equipped with a..... system of automatic temperature control applied to the Her-Nel-Co Ventilator and Magnavent radiators and dampers and all supplementary radiation.

The complete temperature control system shall be furnished and installed by the manufacturer of the above system.

Thermostats

All thermostats for the control of Her-Nel-Co Ventilators and Magnavents shall be of the graduated or intermediate type arranged to control the supplementary radiators and the Her-Nel-Co Ventilator radiators and dampers, or the Herman Nelson Wedge Core Radiators and mixing dampers in the case of the Magnavent, with a true graduated motion.

If desired, compound thermostats may be used, arranged to control the supplementary radiation positively and the other equipment with a graduated action.

All thermostats shall control with a minimum range in room temperatures from full heating to full cooling and shall be adjustable over a 5° range. They shall all be located two (2) feet from the floor.

All rooms shall be provided with a high grade, easy reading thermometer mounted at the five foot level, where directed.

Diaphragm Valves

All supplementary radiators, Her-Nel-Co Ventilator radiators and Herman Nelson Wedge Core Radiators used in conjunction with the Magnavents, shall be equipped with diaphragm valves with springs of the required tension.

Damper Motors

All Her-Nel-Co Ventilator dampers shall be operated by damper motors furnished by the temperature control contractor and installed in the cabinet at the factory by the ventilator manufacturer.

All mixing dampers and damper motors used in conjunction with Magnavents shall be furnished and installed by the temperature control contractor.

Cycle of Operation

The Her-Nel-Co Ventilators and Magnavents and the supplementary radiators shall be controlled in keeping with the cycle recommended by the manufacturer.

All thermostats and spring adjustments required to obtain this cycle of operation shall be made on the job by the temperature control manufacturer.

HERMAN NELSON UNIVENTS

It is the intention of these specifications to provide for a complete installation of Univent Ventilation incorporating the Univent equipment as manufactured by The Herman Nelson Corporation, Moline, Illinois.

Alternate Proposals

If contractor desires to bid on any other make of equipment, he shall submit a base bid on the Univent System and the Univents as specified, and name in his bid the amount to be deducted or added in case substitute equipment is accepted. He shall furnish with such alternate proposal complete literature and data to enable the architect and owner to determine the comparative merit of the proposed substitution. He shall specifically call attention to any changes in the balance of the work that may be required by the proposed substitution. The owner reserves the right to reject any and all alternate bids and to consider quality and merit as well as price. Unless the proposed substitute is selected in awarding the contract, the Univent System, as manufactured by The Herman Nelson Corporation shall be furnished and installed in accordance with the plans, specifications and manufacturer's catalogue. No substitutions will be permitted after the contract is awarded.

Univents

Contractor shall furnish and install all Univents of sizes, capacities and models shown on plans or accompanying schedule. All Univents shall be carefully placed in locations shown and set in accordance with manufacturer's Mechanic's Handbook. Necessary steam supply and return connections with all valves, etc., shall be properly made by contractor and he shall be held responsible for the care of all Univents until the work is completed and accepted by the architect. Univents shall be kept in clean, dry storage until ready for erection, when they shall be set level and firmly attached to the walls in an approved manner. No Univent will be accepted on which the finish or any other part has been damaged in any way through improper handling, insufficient protection or indifferent workmanship.

Univent Motors

All Univents shall be equipped with Her-Nel-Co adjustable speed motors especially designed for Univent service and to operate on [110] [220] volt, [direct] [alternating] [single] [three] phase, [25] [50] [60] cycle current.

Air Intakes

Where Models "SD" and "R" Univents are shown and specified, standard wall intakes as shown in Univent manufacturer's catalogue shall be provided by the heating contractor and delivered to the masonry contractor with complete instructions for installation. Where Model "O", "W" or "WR" Univents are shown or specified, necessary connections and screened intakes shall be furnished and installed by the heating contractor all as per Univent manufacturer's catalogue. The heating contractor shall co-operate with and properly instruct carpenter or other contractors to insure the proper setting and connection of these intakes through the lower window sash or sill.

Univent Finish

All Univent cabinets shall be built of furniture steel neatly finished in "Morocco" brown baked enamel. Outlet grilles shall be of solid cast non-corrosive metal, finished in antique bronze.

Filters

All Univents shall be provided with filters of the adhesive oiled type as furnished by the Univent manufacturers and shown in their catalogue. These shall be installed within the Univent in such a manner that they may be instantly removed or replaced without the use of tools of any kind.

Grilles or Register Faces

Heating contractor shall furnish and install all vent outlet grilles and register faces as per design and construction specified or as called for in drawings in connection with the heating and ventilating system.

Roof Ventilators

Contractor shall furnish and install roof ventilators when and if required of the size and style called for in the drawings. All roof ventilators shall be equipped with tight closing dampers so arranged with cable connections that they may be operated from top story corridor. Where dampers are to be pneumatically controlled, they will be furnished by temperature control manufacturer, and installed by heating contractor.

Humidifiers (Optional)

Where humidifiers are to be specified in connection with the Univents, it will be necessary to correspondingly increase the capacity of the heating plant and the specifications should provide that Univents be equipped with steam jet, nozzle type humidifiers with hand-control valves, as shown and illustrated in the Univent manufacturer's catalogue. If automatic control of humidifiers is required, the automatic control specifications should provide for necessary humidistats, valves and connections.

UNIVENT ELECTRIC WIRING SPECIFICATIONS

The electrical contractors shall furnish and install a complete system of wiring for the operation of all Univents shown on plans, in accordance with the manufacturer's catalogue and other printed instruction.

All wiring shall be done in full accordance with the rules and regulations of the National Board of Fire Underwriters and such state, municipal or local Power Company rules and regulations as may be in force. The general character of the wiring shall be the same as for the lighting system, so far as materials are concerned, providing it meets the requirements above stated. The sizes of wire used shall be such that the greatest drop in voltage, when all Univents are running, shall not exceed three volts. The current requirements for the various Univents may be obtained from the Mechanics' Handbook published by the Univent manufacturers for the convenience of installation mechanics.

Electrical contractor shall leave a wall outlet for each Univent close to the floor and at the right hand end of the cabinet as one stands facing it and shall also confer with the heating and ventilating contractor concerning the exact location of these outlets. Connections between wall outlets and cut-out blocks shall be flexible, flat or rigid conduit, and the work shall be done in a neat, workmanlike manner.

Separate circuits shall be run as follows:

UNIVENT AUTOMATIC TEMPERATURE CONTROL SPECIFICATIONS

(Where automatic temperature regulation is to be specified, the following paragraphs should be inserted in such specifications)

Thermostats

Thermostats which are to control Univent mixing dampers shall be of the intermediate or gradual acting type so arranged that when the air is released from the temperature control system, the Univent warm air dampers will automatically open. Where Univent mixing dampers and direct radiators are to be controlled in the same room, the temperature control system shall be so arranged that the steam supply to the radiators will be closed until such time as the heat from such radiators is required to assist the Univent in maintaining required room temperatures. Where it is desired to also automatically control the Univent radiators, the specifications should provide that the steam supply to the Univent radiators will not be closed until after warm air dampers have been closed and direct radiators have been shut off.

Outside Air or Recirculating Damper Control

Outside air or recirculating dampers shall be arranged so they may be opened and closed in groups from a central point as shown on plans or as required for most satisfactory and convenient operation.

Damper Motors

The manufacturer of the system of automatic temperature control specified shall furnish and deliver to the Univent manufacturers all necessary diaphragm motors, brackets and levers for use in controlling Univent dampers where specified.

The Univent manufacturers shall install them complete within the Univent cabinets and make them ready for connection with the compressed air piping system, which connections shall be made by the mechanic for the automatic temperature control manufacturer.

The latter manufacturer shall make all necessary adjustments and test the operation of the equipment after installation and deliver it to the owner in a first-class operating condition.

Roof Ventilators

Temperature control manufacturers shall furnish all necessary dampers for roof ventilators and connect them for pneumatic operation so that they will always be closed when outdoor air dampers on Univents are closed.

HERMAN NELSON VOLUVENTS

Voluvents

This contractor shall furnish and install in the location shown on the (heating) (general) plans ..... No..... Series Voluvents as manufactured by THE HERMAN NELSON CORPORATION, Moline, Illinois.

Each Voluvent shall be complete with a variable speed Her-Nel-Co Motor, two double inlet multiblade fans, heavy gauge steel cabinet with internal air deflectors and two separate groups of Herman Nelson Wedge Core Radiators.

Voluvents shall be adequately supported as approved by the Architect and shall be set complete with sheet metal and canvas connections as shown on the plans. All lintels over Voluvents and intakes will be furnished and installed by others. The entire Voluvent, except the radiators, shall be furnished in brown lacquer.

Motors

Each Voluvent shall be equipped with a variable speed Her-Nel-Co motor, especially designed and built for quiet operation at all speeds on [110] [220] [direct] [alternating] [single] [three] phase, [25] [50] [60] cycle current.

All motors shall be equipped with fully housed, quiet-running, grease-retaining combination radial and thrust ball-bearings.

All alternating current motors shall be electrically self-starting, free from hum and radio interference and shall not have brushes, commutators, nor mechanical switches of any kind.

All windings shall be carefully insulated and shall have not less than two coats of insulating varnish baked on. All rotors and stators shall be rust-proof.

Each No. 210 and No. 360 Series Voluvent, or group of Voluvents where they are all installed in the same room shall be controlled by a Her-Nel-Co Speed Controller.

All No. 130, 130R and 130SD Series Voluvents shall be provided with tumbler or snap switches located where directed.

All wiring will be done by (this contractor) (other contractor) as specified under Wiring.

Intakes

This contractor shall deliver to the general contractor for setting standard Voluvent heavy steel intakes as furnished by THE HERMAN NELSON CORPORATION and as called for on the (general) (heating) plans. These intakes shall be substantially built of heavy gauge steel with all joints carefully welded and shall have heavy gauge steel louvres, wire screen and frame. They shall be heavily electroplated with cadmium after fabrication and then finished with two coats of brown lacquer.

All lintels over intakes will be furnished and installed by others. All intakes will be painted after erection by the decorating contractor.

Filters (If Used)

This contractor shall furnish and install where shown on the (general) (heating) plans high grade standard make adhesive type filter units as furnished by THE HERMAN NELSON CORPORATION.

Each No. 130R and 130SD Series Voluvent shall be provided with two 21⅛x15⅝x2 in. filter units mounted in a frame inside the cabinet.

Each No. 210 Series Voluvent shall be provided with two (2) 25x20 in. filter units, and each No. 360 Series shall have four (4) 25x20 in. units. These filters shall be mounted on substantial steel angle iron and tee iron frames furnished and installed by this contractor and built as an integral part of the duct in which it is installed.

Furnish one extra filter unit for each four units required for regular service, but not less than two units of each size.

Installation, Duct Work, Dampers, Grilles, etc.

No. 130, 210 and 360 Series Voluvents.—This contractor shall furnish and install the duct work, operating dampers, grilles, etc. as shown on the (general) (heating) plans. All duct work shall be installed substantially as shown, shall be heavy enough to be self-supporting, free from vibration, and shall be thoroughly reinforced to safely carry any load that may be ordinarily put upon it. Furnish and install tight hinged access doors with catches where shown on the plans and where required for access to the motor, fans, filters, dampers, etc.

A suitable canvas connection shall be installed between any duct work and the Voluvent cabinet. Each cabinet shall either be supported from below on not less than 2 in. cork board at all corners in order to prevent the transmission of vibration. Ducts shall be lined with sound absorbing material as shown on plans.

Automatic Control—All dampers as shown on the plans and as specified, and the necessary damper motors shall be furnished by the temperature control manufacturer. All dampers shall be delivered to the ventilating contractor who will install them.

All diaphragm valves shall be furnished by the temperature control contractor and installed by the heating contractor.

Hand Control—All dampers as shown on the plans and as specified shall be furnished and installed by the ventilating contractor and arranged for chain operation as directed.

This contractor shall furnish and install all recirculating and discharge grilles as shown.

Installation of No. 130R and 130SD Voluvents—Each No. 130R and 130SD Voluvent will be furnished complete with all necessary dampers, filter frames, mounting clips, etc. They shall be securely bolted to the ceiling in locations shown on the plans and in accordance with the manufacturer's instructions.

Automatic Control—A damper motor for the operation of the dampers in each unit shall be furnished by the temperature control contractor to the Voluvent manufacturer who will mount it in the cabinet at the factory ready for air piping. Two diaphragm valves shall be furnished for each unit by the temperature control manufacturer and installed by the heating contractor.

Hand Control—The Voluvents will be furnished by the manufacturer and arranged for hand operation of the dampers but the operating chains shall be furnished and installed by the heating contractor as directed by the architect.

Wiring

(In electrical or heating specifications)

This contractor shall wire the Voluvents and controllers complete in accordance with the National Electrical Code and all local ordinances.

This contractor shall furnish and install suitable knife switches and fuses before each No. 210 and No. 360 Series Voluvent motor and Controller, and suitable tumbler or snap switches before each No. 130, 130R and 130SD Voluvent motor where directed.

Piping

This contractor shall furnish and install complete piping connections for each Voluvent in such a manner as to insure free and positive circulation of steam through each group of radiators at all times when the valves are open.

Each supply header shall be provided with a separate (diaphragm valve laid on its side preceded by a gate valve) (or globe valve laid on its side) for control of the radiator.

Vapor and Vacuum System Using Traps—Each return header shall be independently drained through a combination float and thermostatic trap with the top of each return header vented through a small radiator trap.

Gravity System—Each return header shall be independently drained. The top and bottom of each return header shall be vented by combination float and thermostatic main vents.

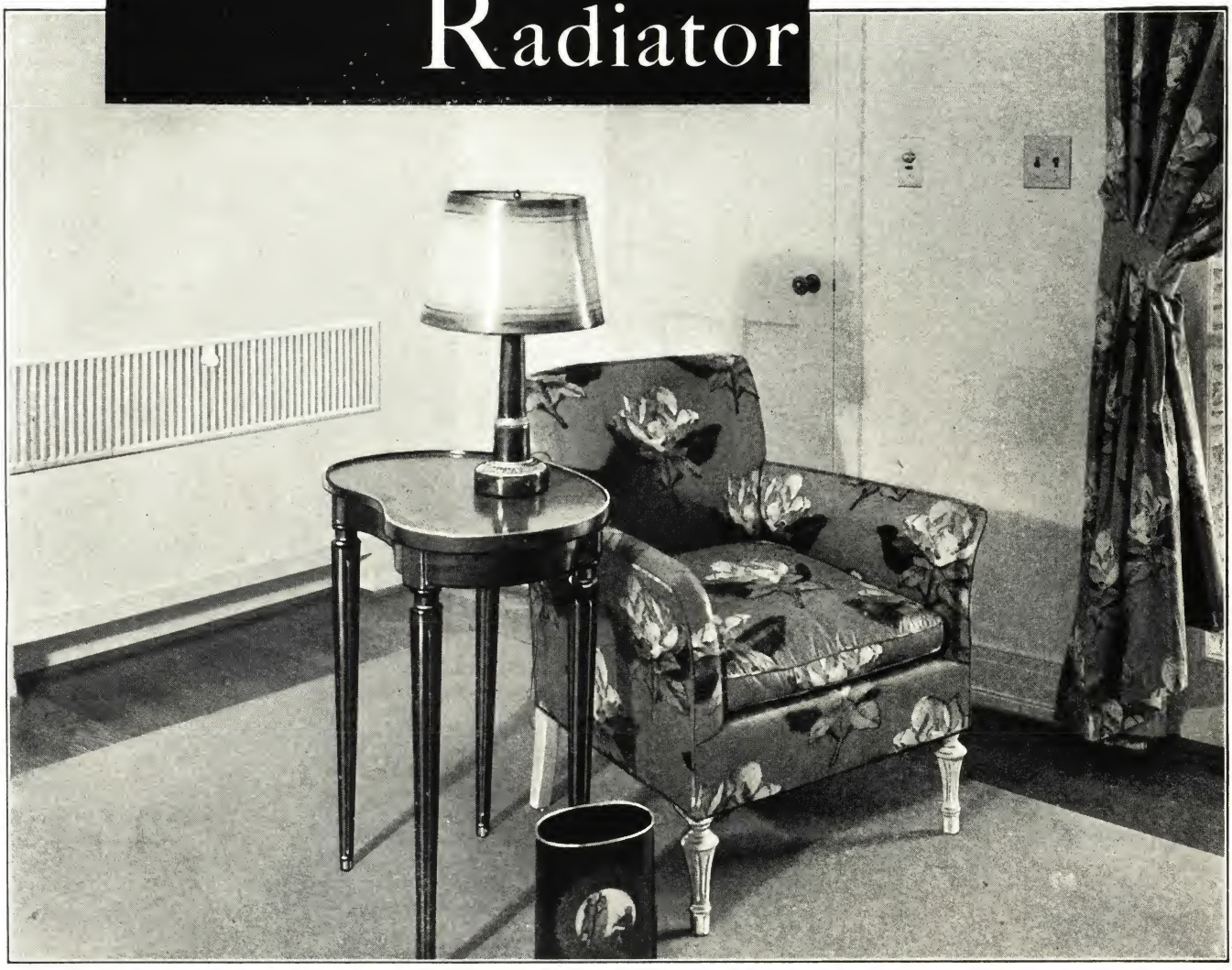
Air Deliveries

After completion of the installation the heating contractor shall mark on the face of the Her-Nel-Co Speed Controller the setting that will run the Voluvents at the proper speed to deliver the volume of air called for on the (heating) (general) plans.

All air deliveries shall be determined with the grilles removed and with the anemometer held two inches away from the face of the radiator in accordance with the A.S.H. & V. standards. The velocity determined in this manner shall be multiplied by the full area of the radiator to obtain the cubic feet of air per minute.

The Herman Nelson *Invisible* Radiator

Encased Within The Wall . . . .

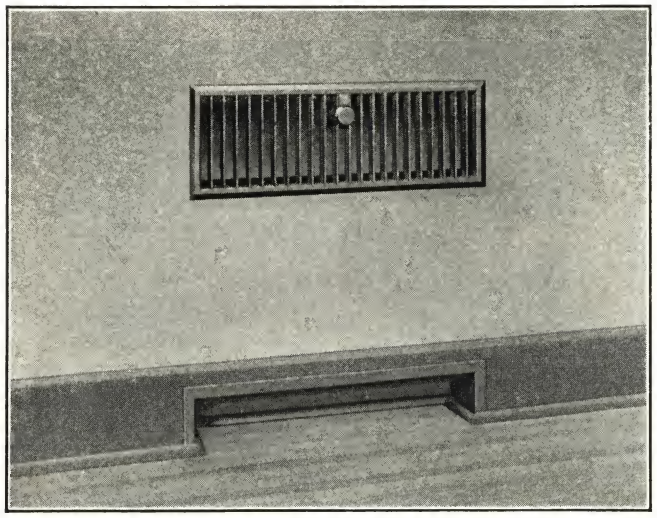


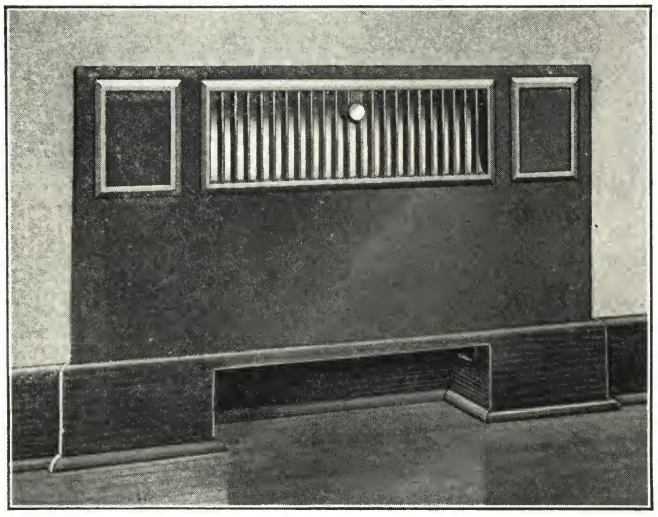
WHEN planning a home, consider the selection of the radiators from two angles. First, what effect will they have on the beauty and comfort of the rooms? Second, will they render long and worry-free service?

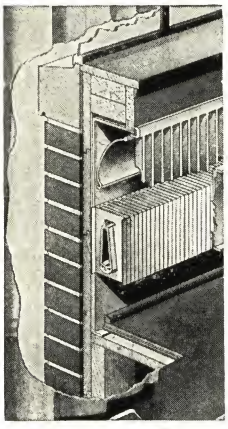
From both angles, the HERMAN NELSON INVISIBLE RADIATOR will be found worthy of your choice. Here is a heating unit so compact that it fits within the wall—thus it does not interfere with the arrangement of the furniture or draperies, and blends with any type of interior decoration.

The Herman Nelson
INVISIBLE RADIATOR

FOR STEAM, VAPOR, VACUUM OR HOT WATER HEATING
FURNISHED IN TWO TYPES: THE "IMMURED" AND THE "PANELED"







In the "Immured" Type, the heating element comes installed in a sturdily built, scientifically designed cabinet with heat outlet grille, and is furnished complete by the manufacturer and installed by the heating contractor into a pocket or recess in wall.

Metal lath and plaster are then applied over the entire front of the cabinet, leaving only the grille exposed to view

"Immured" Type

This type is completely sealed within the wall of the room, permitting the plaster, tile or other wall finish to be run continuously across the front of the radiator.

Control of heat delivery is accomplished to the finest degree by operating the damper.

To attempt provisions for valve control at the radiator with this type is considered impractical and not good engineering. Therefore, this type is recommended for residences, or other buildings, where cut off or automatic control valves and traps may be installed on the pipe branches in the basement, or below the room in which the radiator is installed.

For fine residences and similar buildings, where the ultimate in appearance is desired, the "Immured" type Herman Nelson Invisible Radiator has been accepted and approved as the "last word."

"Paneled" Type

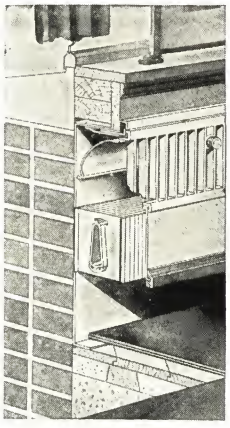
With this type the heat delivery to the room may also be controlled by hand operation of the damper. In addition, the steam or water circulation may be controlled *at the radiator* by a hand or automatic control valve.

The radiator valve is operated by reaching through the small panels at each end. The entire front is instantly removable, without tools, giving complete access to valves, traps and connections.

Recommended for multi-story buildings such as offices, hotels, apartments, etc., where it is impractical to run separate pipe risers, and, in which event, valves and traps should be installed at each radiator where they will be conveniently accessible.

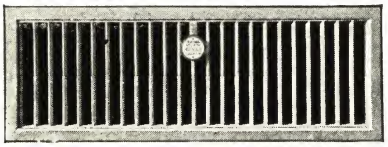
The quality of materials used and the workmanship are identical with that of the "Immured" type.

This radiator occupies no space on the floor or in the room.



In the "Paneled" Type, piping and valve connections are made at opposite ends of radiator. When plastering is finished around the cabinet, the front panel is slipped into place. No furring of walls; no special construction; the complete installation is simple and durable.

Attractive self-closing doors are fitted to front panel for access to valves

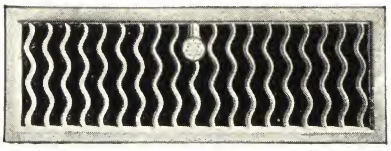


The Standard

Always furnished unless another design is specifically ordered. Because of its straight-forward simplicity, it does not strike a discordant note in any room decoration. Where a more sympathetic design is desired, one of the other grilles shown will meet almost any situation

The Tracery

The Gothic tendency of this design qualifies it for use in English and French Gothic interiors. However, it will also harmonize very nicely with interiors of the Spanish or Italian Renaissance periods



The Wave

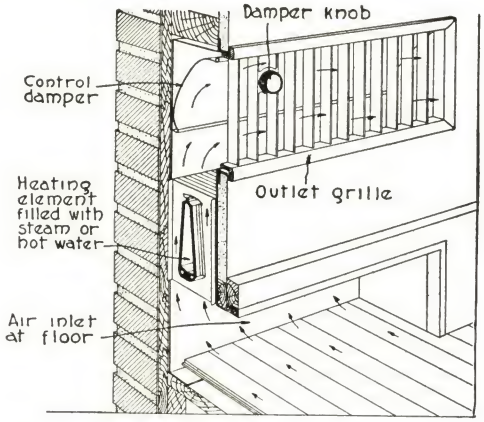
To be fully appreciated, this grille should be considered as a part of an interior rather than a separate design. It is at its best in either formal or informal rooms of the English, Spanish or French Renaissance, while its adaptability to Georgian or modern interiors is obvious

Design and Construction of Cabinet

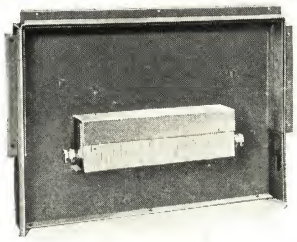
Both types of Invisible Radiators consist of a steel cabinet in which the heating element is mounted. An air inlet opening is provided at the base of the cabinet and a warm air outlet with grille is furnished above the heating element. Cabinets for both types are built of 16 gauge steel with welded and riveted joints.

The operation of all Invisible Radiators depends entirely upon the chimney action caused by the heating element, with the cabinet acting as a flue. This action is always positive, but any slight change in the shape or dimensions of the cabinet, heating element, grille, or air inlet opening will materially affect the capacity of the complete unit. For these reasons, the manufacturers maintain a policy of only furnishing the complete Invisible Radiator, in order that their guarantee of heating capacities can be maintained.

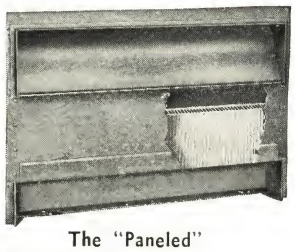
No access is required to the wedge core radiator in Herman Nelson Invisible Radiators. Therefore, it is built into the cabinet of the "Immured" type at the factory. The front of the "Paneled" radiator may be instantly removed or replaced without the use of tools of any kind. No screws or bolts are required to hold the panel in place.



Method of Operation



The "Immured"

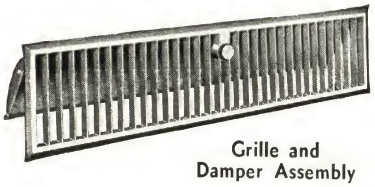


The "Paneled"

Cabinets and Heating Elements as They Are Shipped from the Factory

Cast Grilles

Heat outlet grilles are cast of a light aluminum alloy. The grilles illustrated on the bottom of this and the preceding page are furnished for either the "Immured" or "Paneled" type radiators. These grilles were designed by artists of note, and provide a selection that will harmonize with any style of interior decoration.



Grille and Damper Assembly

Herman Nelson Wedge Core Radiator

The Wedge Core Heating Element (described on pages 2 and 3) has served unfailingly for years in the various products of The Herman Nelson Corporation.

Selecting the Radiator

On the following pages will be found diagrams showing the arrangement of both the "Immured" and "Paneled" type Herman Nelson Invisible Radiators when installed in outside walls.

If the number of square feet of radiation required for a given room has been determined for the system to be used in terms of equivalent direct cast iron radiation set exposed, it is only necessary to refer to the tables of dimensions and capacities to select a Herman Nelson Invisible Radiator or radiators to fit the space requirements and to have capacity equal to the required amount. This is equally true for gravity steam, vapor, vacuum, or hot water system radiators.

If the heat loss is determined in terms of B.t.u. per hour, as recommended by the A.S.H. & V.E. it is necessary to divide the B.t.u. per hour by a factor which depends upon the type of steam used, the temperature of the heating medium in the radiator, and the room temperature.

In the case of vapor, vacuum or gravity steam systems, this factor is 240 B.t.u. per hour for 215° F. temperature and 70° room temperature. This factor is higher for either greater steam temperatures or lower room temperatures and is lower for either lower steam temperatures or higher room temperatures.

In the case of hot water installations this factor varies with the mean temperature of the water in the radiator for which the system is designed and with the room temperature. As in the case of the vapor, vacuum or gravity steam systems the factor is higher for lower room temperatures and vice versa.

The following table will serve as a guide in determining the B.t.u. output per square foot of hot water installations for various water temperatures:

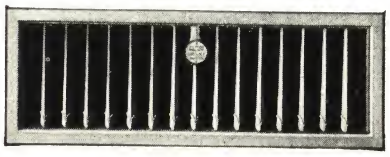
Average temperature of water in radiator, degrees	B.t.u. emitted per sq. ft. of equivalent direct cast iron radiation set exposed for 70° room temperature
160	129
170	148
180	167
190	187
200	208

For example: if the temperature of the water at the inlet is 190° and the temperature at the outlet is 170° the mean temperature of the water in the radiator is 180°. With a room temperature of 70°, 167 B.t.u. will be emitted per hour per square foot of direct cast iron radiation. Then if the total heat loss from the room is divided by this factor the result will be the number of square feet of equivalent direct cast iron radiation required. This figure then determines the size of the radiator as given in the tables of capacities.

Dimensions and Capacities

For the sake of brevity the following table is prepared to indicate the height, length and width of standard stock radiators regularly furnished in both the "Immured" and "Paneled" types.

"Immured" Type			"Paneled" Type		
Width, in.	Height, in.	Length in.	Width, in.	Height, in.	Length in.
3 5/8	20 3/4	15	5 1/2	20 3/8	15
4 7/8	24 3/8	20	7 1/2	24 3/8	20
7 1/2	30 3/8	25		30 3/8	25
		30			30
		35			35
		40			40
		45			45
		50			50

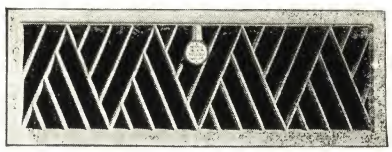


The Bud

This design, based on the sprouting bud motif combines originality, classic simplicity and delicacy without fragility. Because of these qualities it will be found to be in good taste in any formal Georgian, English, French, Adam, Directoire or modern room

The Floral

This pleasing design has unlimited possibilities in informal or semi-informal interiors. It is particularly well suited to Early American rooms



The Geometric

A truly modern design without being faddish. It has characteristics that harmonize with rooms of Early American, English, Chippendale, or Heppelwhite setting, while its suitability for modern and ultra modern rooms is apparent

··CAPACITIES·AND·DIMENSIONS··

··THE HERMAN NELSON INVISIBLE RADIATOR··

·IMMURED TYPE· ·PANELED TYPE·

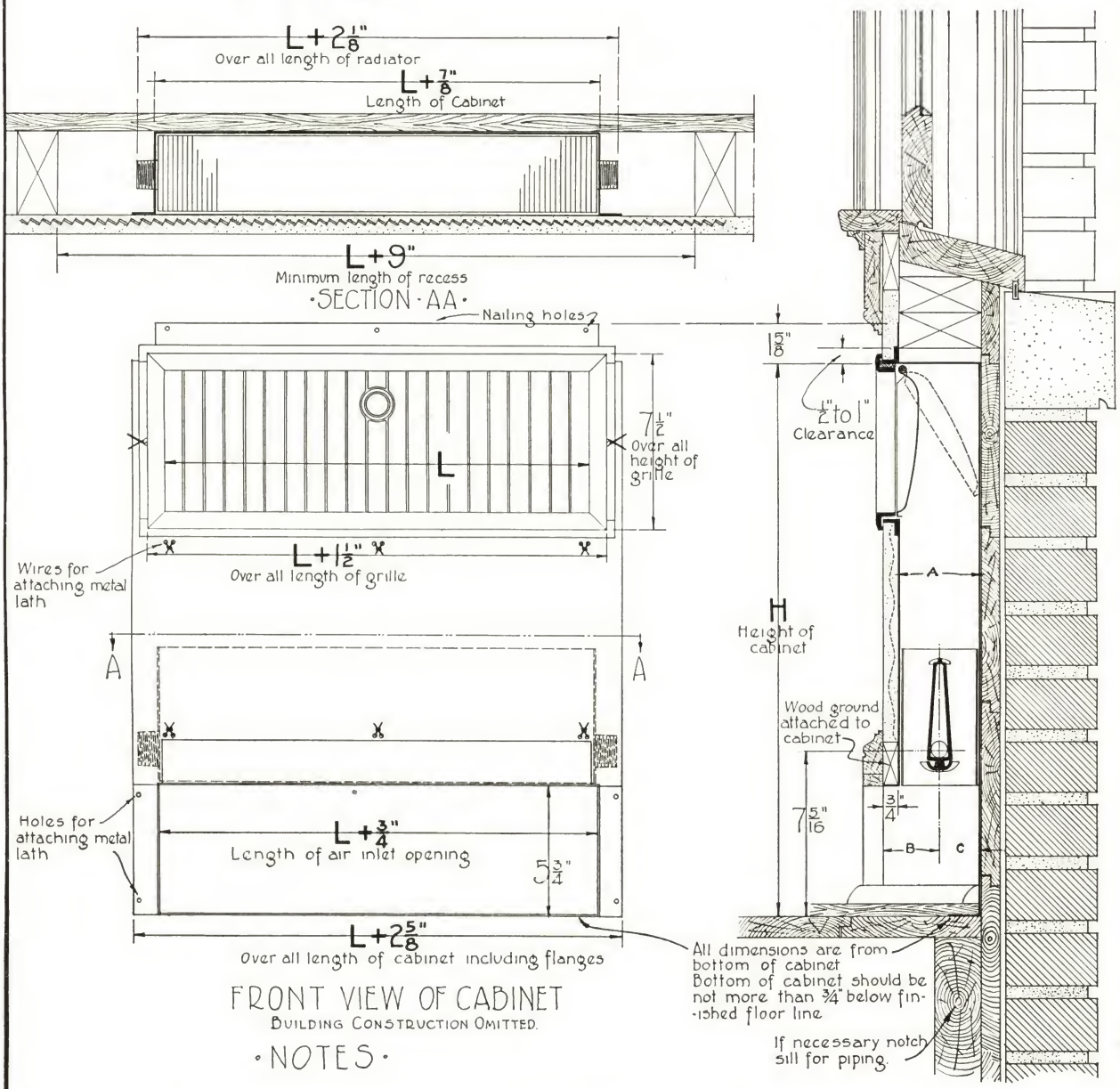
THESE RADIATORS MAY BE USED FOR EITHER STEAM OR HOT WATER. CAPACITIES ARE GIVEN IN SQUARE FEET OF EQUIVALENT STANDARD CAST IRON RADIATION SET EXPOSED IN THE ROOM.

IMMURED TYPE	H 20-3/8"	Number	1511-C	2011-C	2511-C	3011-C	3511-C	4011-C	4511-C	5011-C
		Capacity	10.9	14.5	18.2	21.8	25.4	29.1	32.8	36.4
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
3 5/8"	H 24-3/8"	Number	1521-C	2021-C	2521-C	3021-C	3521-C	4021-C	4521-C	5021-C
		Capacity	11.8	15.8	19.7	23.7	27.6	31.5	35.6	39.5
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
DEEP	H 30-3/8"	Number	1531-C	2031-C	2531-C	3031-C	3531-C	4031-C	4531-C	5031-C
		Capacity	13.3	17.7	22.0	26.4	30.8	35.3	39.7	44.1
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
IMMURED TYPE	H 20-3/8"	Number	1512-C	2012-C	2512-C	3012-C	3512-C	4012-C	4512-C	5012-C
		Capacity	14.8	19.7	24.7	29.7	34.6	39.5	44.6	49.5
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
4 7/8"	H 24-3/8"	Number	1522-C	2022-C	2522-C	3022-C	3522-C	4022-C	4522-C	5022-C
		Capacity	16.0	21.4	26.8	32.2	37.5	42.8	48.2	53.6
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
DEEP	H 30-3/8"	Number	1532-C	2032-C	2532-C	3032-C	3532-C	4032-C	4532-C	5032-C
		Capacity	18.0	23.9	29.8	35.8	41.8	47.7	53.8	59.7
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
IMMURED TYPE	H 20-3/8"	Number	1513-C	2013-C	2513-C	3013-C	3513-C	4013-C	4513-C	5013-C
		Capacity	18.6	24.9	31.1	37.3	43.5	49.7	55.9	62.2
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
7 1/2"	H 24-3/8"	Number	1523-C	2023-C	2523-C	3023-C	3523-C	4023-C	4523-C	5023-C
		Capacity	20.3	27.1	33.9	40.6	47.4	54.2	61.0	67.7
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
DEEP	H 30-3/8"	Number	1533-C	2033-C	2533-C	3033-C	3533-C	4033-C	4533-C	5033-C
		Capacity	22.8	30.5	38.1	45.7	53.3	60.9	68.5	76.1
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
PANELED TYPE	H 20-3/8"	Number	1511-D	2011-D	2511-D	3011-D	3511-D	4011-D	4511-D	5011-D
		Capacity	15.5	20.6	25.8	31.0	36.1	41.3	46.5	51.6
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
5 1/2"	H 24-3/8"	Number	1521-D	2021-D	2521-D	3021-D	3521-D	4021-D	4521-D	5021-D
		Capacity	16.9	22.5	28.2	33.8	39.4	45.2	50.8	56.5
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
DEEP	H 30-3/8"	Number	1531-D	2031-D	2531-D	3031-D	3531-D	4031-D	4531-D	5031-D
		Capacity	18.8	25.0	31.3	37.5	43.8	50.0	56.2	62.5
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
PANELED TYPE	H 20-3/8"	Number	1512-D	2012-D	2512-D	3012-D	3512-D	4012-D	4512-D	5012-D
		Capacity	17.2	23.0	28.6	34.4	40.0	45.8	51.5	57.3
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
7 1/2"	H 24-3/8"	Number	1522-D	2022-D	2522-D	3022-D	3522-D	4022-D	4522-D	5022-D
		Capacity	18.8	25.0	31.2	37.5	43.7	50.0	56.3	62.5
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"
DEEP	H 30-3/8"	Number	1532-D	2032-D	2532-D	3032-D	3532-D	4032-D	4532-D	5032-D
		Capacity	21.1	28.2	35.2	42.3	49.3	56.4	63.4	70.5
		Dimension L	15"	20"	25"	30"	35"	40"	45"	50"

APPLICATION & DIMENSIONS

THE HERMAN NELSON INVISIBLE RADIATORS

IMMURED TYPE



FRONT VIEW OF CABINET
BUILDING CONSTRUCTION OMITTED.

NOTES

All steam connections should be thoroughly tested before lathing and plastering has been completed.

Metal lath should be placed over entire cabinet and recess, attaching to cabinet by means of wire loops

If there is a plate on rough floor it should be removed in recess.

Dimension A 3 3/8" – 4 7/8" – 7 1/2"

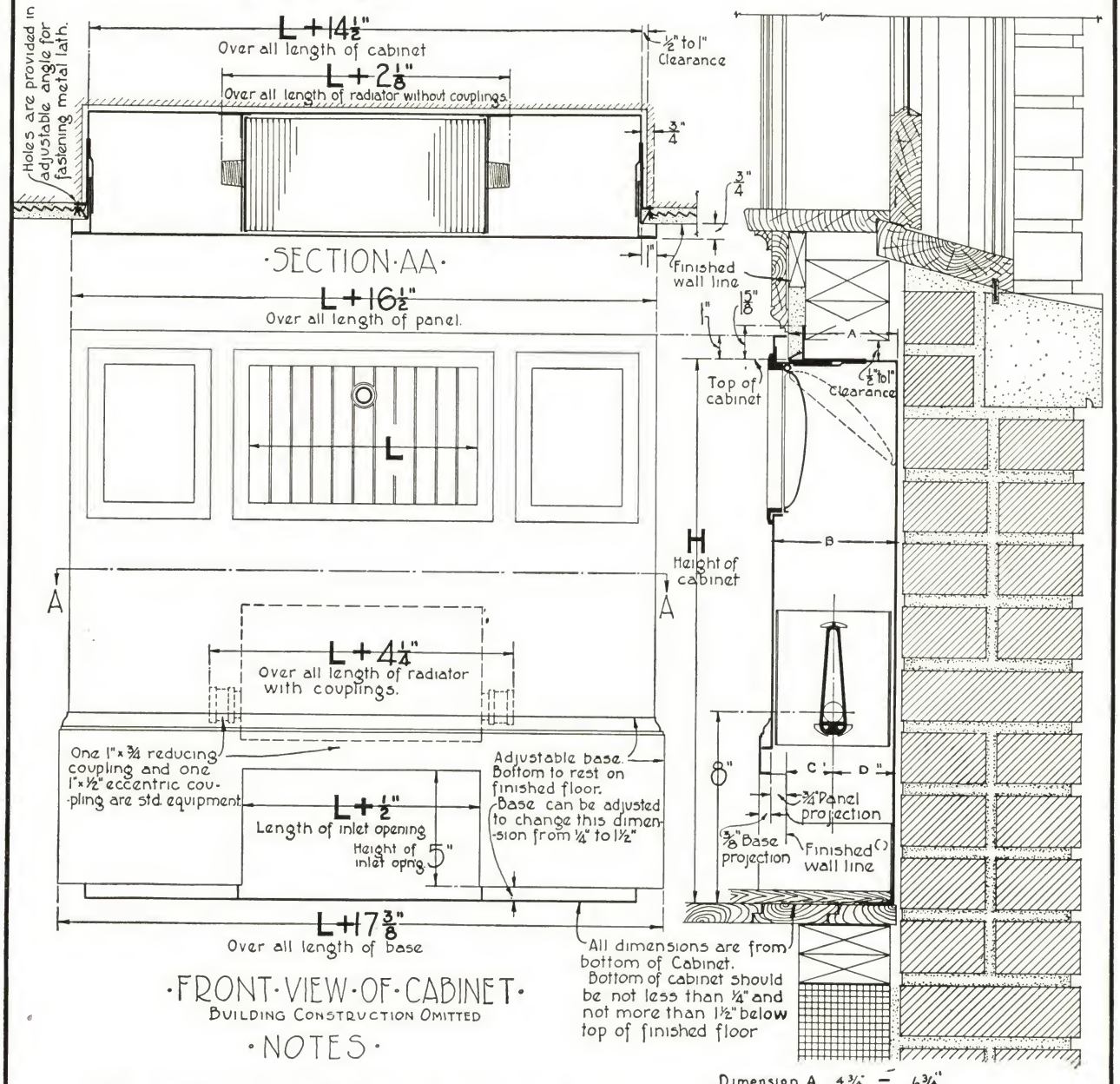
Dimension B 2 9/16" – 3 3/16" – 4 1/2"

Dimension C 1 3/16" – 2 7/16" – 3 3/8"

APPLICATION & DIMENSIONS

THE HERMAN NELSON INVISIBLE RADIATORS

PANELED TYPE



FRONT VIEW OF CABINET
BUILDING CONSTRUCTION OMITTED

Dimension A	4¾"	–	6¾"
Dimension B	5½"	–	7½"
Dimension C	2"	–	3"
Dimension D	2¾"	–	3¾"

NOTES

1. Metal lath should be placed around entire cabinet and recess attaching to cabinet by means of wire loops
2. If there is a plate on rough floor it should be removed in recess.

Suggested Specifications

THE "IMMURED" TYPE INVISIBLE RADIATOR

The heating contractor shall furnish and install, where indicated on plans, or schedule accompanying same, or as directed by the architect, Herman Nelson Invisible Radiators of the "Immured" type, as per the following specifications.

Factory Built Units—All Invisible Radiators shall be furnished as complete units by the manufacturers thereof, including heating elements, steel cabinets, dampers and grilles as selected by the architect, all as shown and described in the manufacturer's latest catalogue. Manufacturers to guarantee capacities to be in accordance with their published ratings.

Installation—These radiators shall be installed by the heating contractor in accordance with manufacturer's printed instructions accompanying same and with proper reference to the wall recesses and wall finish in their respective locations, as shown on plans. Cabinets shall be so set that the bottom of same will not be more than ¾ in. below the top of the finished floor and outlet grille frames are flush with the finished wall.

Recesses—The general contractor will provide the necessary recesses or wall pockets with nailing strips or surfaces at top and bottom as required. The heating contractor shall furnish the general contractor with correct information as to the size and location of all radiator recesses, clearances, and such other information as will enable him to correctly extend the wall finish across the front of the cabinet.

Cabinets—All cabinets shall be substantially built, by the manufacturer, of 16-gauge steel, neatly fabricated and braced. They shall be provided with nailing flanges at top and nail holes in the bottom. Outlet openings shall be provided with heavy welded angle iron frames riveted to cabinets and arranged to act as plaster grounds. In rooms where the wall finish is more than ¾ in. thick, the proper depth angle iron frames for warm air outlet grilles shall be ordered from the manufacturers in order that these frames will extend to the finished wall line.

Front and rear of cabinets shall be provided with galvanized annealed iron wire ties for attaching metal lath. A wood nailing strip shall be provided immediately above the air inlet opening at the base of the cabinet and extending the full length of this opening.

A temporary removable steel shield shall be provided in the grille opening to protect the heating element from plaster and other debris during installation. This shield shall not be removed until the installation is completed and the grille is to be installed.

Painting—The entire cabinet shall be thoroughly sprayed with aluminum paint immediately after fabrication and before shipping. Grilles and dampers shall be finished with one priming coat after fabrication and before shipping, and will be decorated by other contractors to match room decorations. Intake openings shall be painted by others as directed.

Heating Element—The heating element shall be the Herman Nelson Wedge Core Radiator without joints of any kind. The steam or water container shall be a solid one piece aluminum alloy casting. The extended surface shall be in the form of smooth straight aluminum fins securely wedged to the core to afford a tight metal to metal contact without the use of solder. The plates or fins shall be spaced sufficiently far apart to prevent stoppage by the accumulation of lint and dirt and arranged to form straight, smooth, vertical air passages. The assembled sections shall be tested and proved tight under a hydrostatic pressure of not less than 300 lbs. per square inch and shall be guaranteed for a working pressure of 150 lbs. per square inch.

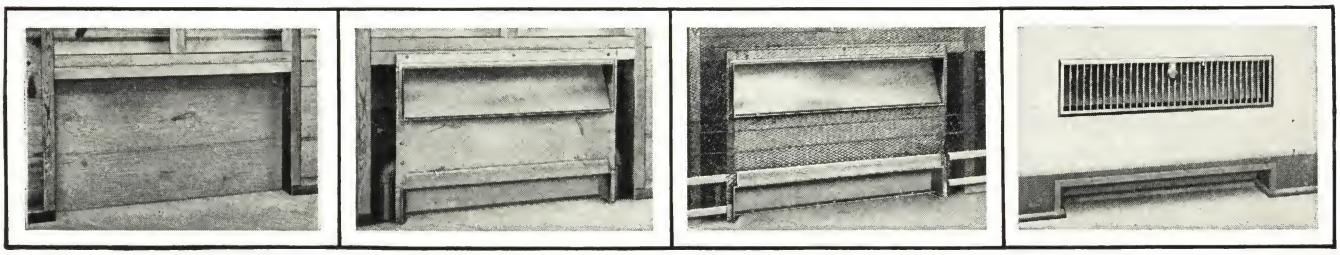
Where hot water is used for heating, this contractor shall install hand operated air valves in the vent tappings in the heating element. Air vents shall be arranged to be operated through the opening at the base of the cabinet.

Grilles and Dampers—All outlet grilles shall be cast of the designs listed in the schedule or as shown on the plans. Design names refer to illustrations in manufacturer's catalogue. A light weight single piece damper shall be provided behind all grilles, with operating mechanism for the operation of dampers. The damper and operating mechanism shall be attached directly to the grille so that the entire assembly may be removed as one piece. The mechanism shall be so arranged that the damper may be held in any position from full open to tightly closed without danger of becoming dislodged.

Alternate Proposals—The contractor shall submit bid on the materials herein specified in order to qualify as a bidder. Alternate proposals on other makes of radiators, as approved by architects, in writing, will be considered. However, alternate proposals shall state the deduction or addition to be made in case of substitution and shall be filed with base bid, clearly made out on a separate form and accompanied by complete alternate schedule, specifications, literature and other essential data.

SCHEDULE OF THE "IMMURED" TYPE

Room name or number	Floor name or number	Type of Invisible Radiator	Number of Invisible Radiators of same size	Capacity of each Invisible Radiator, sq. ft.	Catalogue Number of Invisible Radiators	Catalogue name of grille	With or without control damper	Depth of outlet frame, in.	Overall size of recess, in.		
									Length	Height	Depth
Living room	First	Immured	2	32.2	3022-C	Bud	With	¾	39	25	4⅞
Bath	Second	Immured	1	22.8	1533-C	Standard	With	1½ (tile finish)	24	31	7½



The Recess

Radiator nailed in place at top and bottom and piping installed. Note wire lath ties provided

Metal lath applied ready for plastering. Note the rib lath across front of cabinet

The finished installation. Sides and back of inlet formed by the steel cabinet painted to match the baseboard

Suggested Specifications
THE "PANELED" TYPE INVISIBLE RADIATOR

The heating contractor shall furnish and install, where indicated on plans, or schedule accompanying same, or as directed by the architect, Herman Nelson Invisible Radiators of the "Paneled" type, as per the following specifications:

Factory Built Units—All Invisible Radiators shall be furnished as complete units by the manufacturers thereof, including heating elements, steel cabinets, adjustable angles, removable panels, adjustable bases, dampers, and grilles as selected by the architect, all accessories as shown and described in the manufacturer's latest catalogue.

Installation—These radiators shall be installed by the heating contractor in accordance with manufacturer's printed instructions accompanying same with the bottom of the cabinet as near the finished floor line as possible but not closer than ¼ in. nor farther than 1½ in., and with proper reference to the wall recesses and wall finish in their respective locations, as shown on plans.

Recesses—The general contractor will provide the necessary recesses or wall pockets, with nailing strips or surfaces at top and bottom, as required. The heating contractor shall furnish the general contractor with correct information as to the size, clearances, and location of all radiator recesses and such other information as will enable him to make proper provisions for the installation of the radiators.

Cabinets—All cabinets shall be substantially built, by the manufacturers, of number 16 gauge steel, neatly fabricated and braced. They shall be provided with adjustable nailing flanges at tops and sides with necessary holes for nailing cabinet in place and tying metal lath.

Removable Fronts—All cabinets shall be provided with front panels, having a tongue and grooved joint, which may be instantly removed or replaced without the use of tools of any kind. They shall be provided with spring hooks for quickly fastening to the cabinet to hold them securely in place. Self closing hand access doors shall be provided in cabinet fronts for access to radiator controlling valves.

Adjustable Bases—Front panels shall be furnished with steel bases that may be adjusted up or down to meet the varying finished floor levels. Sufficient adjustment shall be provided to permit the distance from the bottom of the cabinet to the finished floor to vary from ¼ to 1½ in. After plastering is complete and finished floors are laid, the contractor shall so adjust these bases and fit them in place that the panel may be easily slipped out to provide immediate access to the valves, traps and other connections.

Painting—The cabinet shall be thoroughly painted by the manufacturer, immediately after fabrication. The front panel shall be painted with one coat of brown paint immediately after fabrication and before shipping. It will be finished to match room finish by other contractors. Grilles and nigger bronze. All painting as described above shall be done immediately after fabrication and before shipping.

Heating Element—The heating element shall be the Herman Nelson Wedge Core Radiator without joints of any kind. The steam or water container shall be a solid one piece aluminum alloy casting. The extended surface shall be in the form of smooth straight aluminum fins securely wedged to the core to afford a tight metal to metal contact without the use of solder. The plates or fins shall be spaced sufficiently far apart to prevent stoppage by the accumulation of lint and dirt and arranged to form straight, smooth, vertical air passages. The assembled sections shall be tested and proved tight under a hydrostatic pressure of not less than 300 lbs. per square inch and shall be guaranteed for a working pressure of 150 lbs. per square inch.

Where hot water is used for heating, this contractor shall install hand operated air valves in the vent tappings in the heating element. Air vents shall be arranged to be operated through the opening at the base of the cabinet.

A temporary removable steel shield shall be provided over the heating element to protect it from plaster and other debris during installation. This shield shall not be removed by the contractor until the installation is completed including plastering, and the front panel is to be installed.

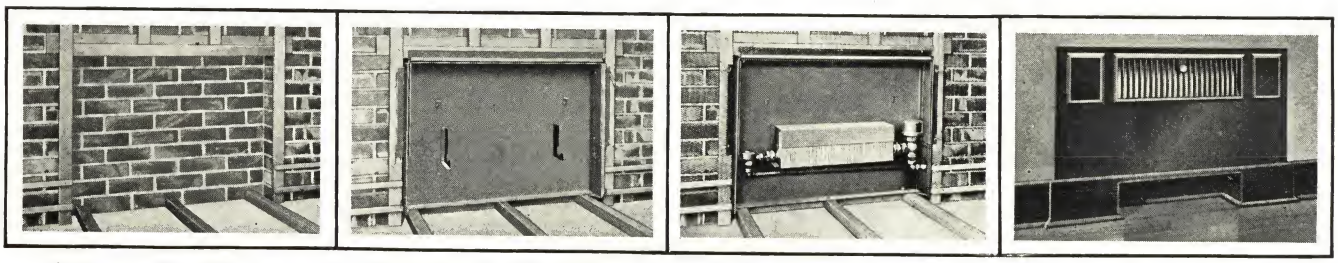
Grilles and Dampers—All outlet grilles shall be cast of the designs listed in the schedule or as shown on the plans. Design names refer to illustrations in manufacturer's catalog. A light weight single piece damper shall be provided behind all grilles, with operating mechanism for the operation of dampers. The damper and operating mechanism shall be attached directly to the grille so that the entire assembly may be removed as one piece. The mechanism shall be so arranged that the damper may be held in any position from full open to tightly closed without danger of becoming dislodged.

Alternate Proposals—The contractor shall submit bid on the materials herein specified in order to qualify as a bidder. Alternate proposals on other makes of radiators, as approved by architects, in writing, will be considered. However, alternate proposals shall state the deduction or addition to be made in case of substitution and shall be filed with base bid, clearly made out on a separate form and accompanied by complete alternate schedule, specifications, literature and other essential data.

SCHEDULE OF "PANELED" TYPE

Room name or number	Floor name or number	Type of Invisible Radiator	Number of Invisible Radiators of same size	Capacity of each Invisible Radiator, sq. ft.	Catalogue number of Invisible Radiators	Catalogue name of grille	With or without control damper	Type of base	Overall size of recess, in.		
									Length	Height	Depth
Office No. 1	Mezzanine	Paneled	3	20.6	2011-D	Floral	With	Wood	36	21	4¾
Lobby	Main	Paneled	2	70.5	5032-D	Standard	Without	Standard	66	31	6¾

PROGRESSIVE STEPS IN THE INSTALLATION OF THE "PANELED" TYPE



The recess. Note that sleepers have been run into recess

The cabinet nailed in place at top and bottom. Heating element removed

Heating element and piping installed. Metal lath wired in place and ready for plastering

The complete installation with steel back and sides of inlet opening painted to match the panel

THE HERMAN NELSON CORPORATION is constantly striving to improve its products in order that they may better serve the ultimate user. For this reason the manufacturer reserves the right to make any improvements or changes that may be deemed advisable, without notice.

HERMAN NELSON

HEATING AND VENTILATING
EQUIPMENT